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THE DISEASES OF CHILDREN

THE

DISEASES OF CHILDREN

BY

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EIGHTH EDITION

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1905

Ah, World of ours, are you so gray
  And weary, World of spinning,
That you repeat the tales to-day
  You told in the beginning?

Old World Idylls, and other Poems.
AUSTIN DOBSON.

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PREFACE TO EIGHTH EDITION.

In its Eighth Edition, and after twenty years, my bantling may be said to be growing up. But under the kindly and careful supervision and editorship of Dr. Still, it cannot be said to be growing *old*, for it is certain that each birthday, coming round as it does very regularly for a book, sees it increasing both in wisdom and stature. I was indeed fortunate in my selection of a foster-father for my child. Every new Edition has some share of the time of each of us, but the greater part by far has been given by Dr. Still, and for it the fullest acknowledgment is but an inadequate recognition.

JAMES F. GOODHART.

May 1905.

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PREFACE TO FIRST EDITION.

Many medical students have expressed to me their want of a small Manual upon Diseases of Children. To this, and to a request from Messrs. Churchill that I would fill up a gap in their series of Student's Guides, the appearance of the present volume is due. There are many who could have done the work far better than I; but, if an excuse be needed for well-intentioned temerity, it may be supposed that others were unable to undertake it.

As regards the scope of the work—in writing a book upon diseases of children I have not considered it my function to write one on general medicine, but so far as possible have kept in view the diseases which seemed to be incidental to childhood, or such points in disease as appear to be so peculiar to, or pronounced in, children as to justify insistence upon them; and if the book meets the want it aims to supply, it will be due, I think, as much to its omissions as to its contents. For example, in dealing with pneumonia and bronchitis, there will be found no minute description of physical signs; in heart disease, no consecutive account of such general symptoms as are common to all ages of life. I have taken it for granted that the student already possesses some knowledge of general medicine, and have dwelt upon such points as belong peculiarly to childhood. This will explain a certain amount of disconnectedness which runs through the volume; and if beyond this it still be thought that I have been less precise than is desirable, I would reply that it is always difficult to be at the same time dogmatic and exact. "Knowledge brings doubts and exceptions and limitations, which are all hindrances to vigorous statement." Moreover, what may be considered a fault in some ways, is not without some, and perhaps equivalent advantages; not the least being the fact that this conception of the student's wants has enabled me to follow more closely my own bent than would have been possible in a more systematic treatise. I am not without hope that in thus acting I may have accomplished at least one aim—viz., to supplement, not to supersede, the admirable text-books already existing on the diseases of children. My obligations to these already published works I cannot attempt to sum, unconscious memory plays so large a part in the thought of every one of us. But this much I can say, that it gives me no common pleasure to confess how much I owe to West, Rilliet and Barthez, Hillier, Eustace Smith, Henoch, Gerhardt, Steins, Meigs and Pepper—amongst others; and last, but not least, to two of the most realistic writers of our own day, Dr. Samuel Gee and Dr. Thomas Barlow. I have also availed myself of the observations upon the incubation of the exanthemata, which have from time to time appeared in the *Lancet* during the last few years, from the pen of Dr. Clement Dukes, of Rugby. Dr. Dukes' work in this direction is some of the most valuable that exists.

Of others who have more immediately helped me I must thank Dr. Newnham, our present resident medical officer at the Evelina Hospital, for aid on several occasions. Mr. Collier, head of the dispensing department at Guy's Hospital, has been kind enough to revise the Appendix of Formulæ; and my brother, the Rev. C. Alfred Goodhart, of Sheffield, and Dr. Lewis Marshall, Surgeon to the Hospital for Sick Children at Nottingham, have been at much trouble in revising and criticising the proof-sheets. Of the labour thus ungrudgingly bestowed I alone can fully appreciate the value.

JAMES F. GOODHART.

January 1885.

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THE DISEASES OF CHILDREN.

INTRODUCTION.

WHAT is a child, and how the diseases of children differ from the diseases of adult life, are questions which must have confronted all who have written upon the ailments of childhood, and not a little puzzled them for an answer. By the pathologist, indeed, it may well be doubted if any valid reason can be given for separating diseases of children from those occurring at other epochs, for there are but few morbid changes found in childhood that are not to be seen at one time or another in the bodies of adults.

If we run over the various regions of the body, the brain, heart, lungs, lymphatic glands, and so on, few, and those but minor, differences can be pointed out between the products of disease in the child and of the same in an adult. Some diseases are more common at one time of life than at the other; but should they overstep the limit of age usual to them, they appear in their old form, or with but slight modifications, such as would certainly not justify any one in devoting even a "manual" to their description.

The bones form the most notable exception to this rule: in rickets, in some forms of ostitis and of enchondroma, we have examples of constancy of peculiarity of morbid deposit; of constancy of limitation to the growing age; of constancy of peculiarity of distribution of the disease, and so on. Certain diseases of the skin and teeth might equally be advanced, but, having said even this, we should still be at fault for material for a book. The difficulties and differences which render it advisable that the diseases of childhood should receive special study are mostly those of semeiology and treatment; or they arise because the student, when first introduced to this branch of practice, finds himself thrown upon his own resources. In the *adult* questions can be asked and clues obtained which, notwithstanding that they often mislead, are, on the whole, a considerable aid in forming a diagnosis. With infants and children the history is faulty or often quite wanting, and here the student fails. For instance, it is a common occurrence in hospital practice to find that no account is forthcoming from the clinical clerk of some child that has been admitted since the last visit of the physician. "I have not yet seen the mother!" is the explanation that is offered. Supposing now that we change the venue, so to speak, of this illustration to that of the veterinary surgeon, and one of the lower animals, and such an answer, were it conceivably possible, would be ludicrous. Yet there is not so very much difference between the student who has to investigate the diseases of children, and one who has to deal with those of the lower animals. In both cases the diagnosis will chiefly rest upon the doctor's personal observation and examination; in both it is intelligible speech that is wanting. I am by no means desirous of underrating the history which a parent or relative can give; on the contrary, an intelligent mother and nurse are to be listened to patiently and attentively—they are often acute observers of early signs of ill health or changes in the symptoms. All I wish to enforce is, that the previous history occupies a subordinate, not the chief position, and the student is at all times to consider himself as independent of it. Any help that can be obtained in this way is good, but it is to come after, not before, a personal examination.

Supposing now that a child is before us, what is to be done in making a thorough examination? Our first care will be not to frighten the child—a task which at once calls into play tact, patience, and control of feeling. A strange face is alone sufficient to make a child cry, but, when that face belongs to the doctor, a word very early added to the child's small repertory, and when, as is often the case, it is associated indelibly with the memory of castor-oil or Gregory's powder, inexperienced nature can hardly be expected not to revolt—and revolt it often does, regardless sometimes of the most exquisite tact. But much can be done to smooth matters by the expenditure of a little trouble:

never be in a hurry; take time, that the child may become accustomed to you; play with it, show it any glittering thing that may be at hand, and give it the stethoscope to play with, but, above all, talk to it. The soothing effect of a sympathetic voice is very apparent in dealing with children; even an infant will often show no fear so long as you talk to it.

Any instrument that it may be necessary to use should first be made a plaything, the subsequent examination being often much facilitated by so doing. It may not be out of place to mention here a little point in the use of the stethoscope which will often be found of value in the examination of infants and even of older children. In placing the end of the instrument on the chest, holding it in the usual way between the forefinger and thumb, rest the little finger and ring-finger on the skin of the chest for a few seconds before bringing the end of the stethoscope in contact with the skin. The warm fingers seem to prepare the child for the unaccustomed sensation of the hard and too often cold stethoscope. This may seem but a trifling point, but it may make just the difference between a difficult and an easy examination. Do not touch a child till it has had a good look at you. Plenty of occupation is afforded in the meantime by talking to the mother or nurse.

Then, with regard to special instruments—the thermometer, for instance, which is constantly in use, put it into the axilla and hold it there gently, with your eye on the column of mercury, talking to the child all the while, and even drawing its attention to it. If the forearm is not restrained, it will be possible to do this for a minute or two, during which you may watch the mercury quickly rise to a certain height, after which it proceeds more leisurely. If the child become restless, withdraw the instrument—the half-degree or so which the column may rise afterwards will be of little importance in drawing conclusions, whereas a fit of crying or any fright will render all further observations difficult. Some advise that the temperature should be taken in the rectum, and no doubt there is more safety from possible error by so doing; but if the medical man is making the observation himself the axilla is reliable, or it may be taken in the groin, or well down between the scrotum or labium and thigh. The latter is the place if the child be asleep, but the reading will be, probably, not quite so high as in the axilla, and still less so than in the rectum. Whenever the surface has been exposed by bathing, or otherwise, the rectal temperature is alone reliable, at any rate in babies ; in older children the mouth may be available.

With the ophthalmoscope, again, try to get the instrument considered as a toy, the examination a game of play, and—with plenty of patience, for a child's eye partakes of the restlessness of its whole muscular system, and no fixed look at any object, however attractive, can be counted upon for more than a second or two—there are few children or infants in whom the optic discs may not be seen. It is essential to success in many cases not to touch the child. As soon as a finger is placed upon the forehead to steady the lens used for the indirect method, many a child will rebel. The same remark applies still more forcibly to pulling up the upper lid to obtain a view of the pupil. The attention must be attracted by playing the light on and off the eye, and skill will come with practice in ascertaining the state of the fundus by repeated momentary glimpses rather than by any one prolonged view. If the child is asleep when the ophthalmoscope is to be used, it is worth while to try whether the examination can be made without waking the child: with extreme gentleness in raising the eyelid it is sometimes possible to get a very complete view of the fundus during sleep.

Even the hæmacytometer, for which it is necessary to prick the finger, may be used without causing a child to cry, by making a rapid prick with a needle, and showing the resulting drop of blood to the child as a wonderful thing. As a rule, however, it is much better to use the lobe of the ear for this purpose. The prick in this situation causes less pain, and the sight of blood which sometimes frightens timid children can be avoided altogether.

Let me next say that the child is to be restrained as little as possible in any examination that may be necessary. The mother or nurse will often hold hands or legs, or crunch the head down upon the chest, as the first step to auscultation, and there is nothing which a child resents more than restraint of this kind. Let the limbs be free to play or kick till they become unmanageable, and this will but seldom be the case if a little care be exercised. Let a baby play with the end of the stethoscope if it will ; it is quite possible to distinguish the respiratory sounds ;

and after a time those of extraneous origin can be as readily ignored as can the noise made by a crying child. The fact that the child is crying is no excuse for not examining the chest—crying necessitates deep respiration, and is often advantageous for this reason. All that we need is more patience. In auscultation, also, it is often necessary to listen to the respiratory or heart sounds in snatches, and to fill in by repeated observations what is not permitted by continuous examination; and in many cases it is advisable to examine the back of the chest first.

Having given these few hints upon what to avoid, a few may follow concerning what has to be done—and first we must be careful to maintain an attitude of close observation. The points to be observed are often apparently trivial and difficult to keep in mind in any systematic way. There is the complexion of the child; the formation of its bones, the state of its skin and muscle—is it fat, spare, firm, or flabby; its size in proportion to its age; its general build; the shape of its head; the state of its fontanelle; the relative proportions of head and face; the condition of corneæ and pupils; the lines upon the face; the state of the nostrils; the gums, the teeth, the tongue; the ears; the shape of the chest and its movements; the abdomen and its movement; the character of the cry and the state of the nervous system. All these details, and many more, indicating as they do points negative and positive which are absolutely essential to the formation of a diagnosis and for forecasting the issues of the case and for treatment, must yet, being but preliminaries, often be taken in almost at a glance. To allow of this being done in any sense completely, it is well to take each step in a regular method. Start where you will, adopt any plan, but proceed as much as possible upon this plan; and, while rapidity of execution comes with practice, abundant compensation will be obtained for any trouble that may be involved, in the frequency with which by so doing conclusions will be arrived at, and results obtained, which had not previously been expected, and would in all probability have been missed by less methodical observation. It is impossible in a short manual to go much into detail in a preliminary chapter, but one or two points may be selected to illustrate the importance of what has been said. For instance, the **cry** of a child may help to distinguish the ailment under which it is labouring. There is the noisy passionate cry of hunger; the wail of abdominal disease; the whine of exhaustion; the short sharp shriek of cerebral disease; the hoarse whispering cry of laryngitis. Much may be learned by a glance at the shape of the head. The **hydrocephalic head** is one which bulges in all directions. The forehead projects; the temporal fossæ become convex; the fontanelle and vertex more vaulted; even the occiput becomes more rounded, and in this general tendency towards the assumption of a globular form in place of an ovoid, the inter-ocular space is widened outwards and the eyes are rendered too divergent.

The **rickety head** is an elongated one, and often laterally compressed or flattened and quadrilateral, and, although the forehead may be overhanging, it wants the width and general rounding seen in hydrocephalus. The head of the **syphilitic** child is sometimes of irregular shape, almost lobulated in appearance, and betrays its component bones by the position of the enlargements. The shape is due to osteophytic growth which forms upon the bones round the anterior fontanelle and spreads thence over their surfaces. The fontanelle may thus appear to lie in a hollow between four hillocks, one on each parietal and on each frontal bone. But sometimes the inter-frontal suture is converted into a vertical ridge, from the exuberant bone-formation along it. The skull thus affected has been called the **natiform** skull, from the appearances produced by the bony elevations, and, as the bones are often soft, "craniotabes" may be present likewise. We have called this form of skull syphilitic, but it is not yet certain whether the changes described are caused by syphilis or rickets, or possibly in some cases by both combined.

The **scaphoid skull** is a narrow skull, in which the frontal region is boat-like and slopes away from the median line, betokening the small brain of an imbecile or idiot. The **fontanelle** by bulging may indicate excess of blood or cerebrospinal fluid within the cranium; by its size it may indicate defective ossification, and so rickets; but of more importance, because of almost invariable significance, is the depressed fontanelle of starvation and exhaustion: it indicates the immediate necessity of food or stimulants. As regards the face, it may be mentioned that shades of pallor are most suggestive—a dirty white (*café au lait*) stands for congenital syphilis ; a sallow white for splenic disease ; a pallor with a subtint of blue (*milk and water*) for tuberculosis ; a livid, leaden, or earthy tint for collapse from abdominal disease.

There are certain markings upon the face—Jadelot's lines as they are called, from the French physician who has described them very fully. Of these it must suffice to say that about the eyes or forehead they are usually indicative of cerebral disease. The nostrils are chiefly concerned in respiratory disease, the lines dividing outward from the mouth are occasionally seen in abdominal disease : one from the angle of the mouth outwards on to the cheek in respiratory disease. Then there are the various complexions which are supposed by many to indicate particular diatheses or tendencies to disease—The pretty, thin-skinned children of tubercular proclivities ; the sallow, muddy appearance of children prone to glandular abscesses : the dark-haired, pallid, but, on the whole, well-liking children of nervous habit, and so on. Of these, though they have in former times occupied much of the attention of writers of books, I shall say but little, because there is now considerable want of unanimity upon the subject, and because their importance is hardly measurable by facts, but depends upon inferences the accuracy and worth of which the student must test for himself. There is the sunken eye, the dark-coloured and depressed areola around it, indicative of collapse ; the dilating alæ nasi of acute lung disease ; the lividity of lips of chronic lung disease ; the puffy congested eyelids and ecchymosed face of whooping-cough. For the **chest** we have the immobility of pleurisy ; the unnatural præcordial bulging of a large heart : the sinking in of the lower ribs of atelectasis. Of the **abdomen** it may be said that enlargement is not necessarily due to disease. Children will constantly be brought for "consumption of the bowels," because they have diarrhœa and a large stomach. In the great majority of cases the enlargement is due to flatulent distension from defective feeding : sometimes to displacement of the liver and spleen by distortion of the thorax in rickety children. In *many* such there will be but *few* cases of organic disease, and of mesenteric disease it may be said that it is but seldom associated with any abdominal enlargement sufficient to attract the attention of the child's mother, and in my experience there has not often been any disease of the glands that could be felt by external palpation. Of other diseases which give rise to abdominal enlargement in childhood a large liver or spleen, ascites, or renal tumours are perhaps the most frequent.

When we come to the more personal examination of the child, I would still inculcate the necessity of routine. It matters not how we proceed, so long as some definite plan is regularly followed. Supposing, as is probable, that some idea of the nature of the case has been gleaned from the preliminary survey, it is a good plan to start with the organ which is supposed to be at fault. If there be any reason for suspecting disease of the nervous system, it is as well at once to examine the eyes with the ophthalmoscope, lest any subsequent action on our part may frighten the child and render the fundus oculi inaccessible. It is impossible to make any satisfactory use of the ophthalmoscope if the child is, or has been recently, crying. This done, and the state of the pupil and movements of the eyeball ascertained, the sight and hearing can be tested by a watch; and the precision of the various muscular movements of the extremities, by giving the child something to hold or pick up, and by making it walk, if old enough, or by watching the movements of the limbs in infants too young to walk, as they lie on the mother's lap. The knee jerks should be examined, if possible, in all cases. Both diphtheritic and infantile paralysis have been overlooked by neglect of this precaution, but tact and patience may be needed in eliciting the reaction in children. It is a mistake to imagine that the jerk is more likely to respond to heavy percussion; the lightest tap is often the most effective. The difficulty in most cases is to obtain relaxation of the muscles, but it may be overcome by letting the child's foot rest on your hand, or even push gently against the hand, and then tapping very gently on the patellar tendon and watching the quadriceps contraction as the index of the jerk.

The gums can be examined and the progress of dentition ascertained by gently rubbing the surface of the gums with the finger. The chest and abdomen should be examined in all cases. Some advise that the child should be stripped for this purpose, and this is a necessary measure in some cases. It is not perhaps to be recommended as a rule, for the reason adopted throughout these suggestions—viz., that the child is to be frightened or put out of temper as little as possible. Children, all but the youngest infants, resent the process of undressing, and it is usually sufficient for our purpose that all the clothing be loosened. The greater part of the front and back of the chest can be by this means exposed and a thorough examination made. Percussion must be light, or it will mislead. A cracked-pot sound can be produced with facility in many a healthy child. A light vertical tap with one or two fingers upon a finger of the other hand placed flat upon the chest is all that is necessary, and special attention is to be paid to the inter-scapular grooves as parts which are more frequently implicated in children than in adults. In auscultation it is very essential to make careful comparison of the two sides; of the bases with the apices; and to remember that it sometimes happens that the more abnormal sounds are heard in the healthier lung. A student will often describe as bronchial breathing the exaggeratedly puerile respiration of the over-acting but sound lung, and consider as healthy the soft and deficient vesicular murmur of the diseased side, and indeed there is abundant excuse for his so doing. Again, disease may be ascribed to the apex of the lung from the existence of bronchial breathing, whereas the primary disease is really at the base. Therefore, the whole of the chest must be auscultated: above and below the clavicles; the supra-spinous fossæ behind, the inter-scapular grooves and bases; and we must be on the alert to detect even slight differences between the two sides.

The examination of the abdomen is chiefly conducted by means of palpation—the existence of enlargement of the spleen or liver is ascertained in this way; so also that of other abdominal tumours. But there are other points of detail which are well worth attention. In the first place, it is worse than useless to put a young child on its back and uncover it for examination. It will kick and scream, put its muscles into a state of rigidity, and nothing can be made out. One must often be content with an examination while the child is sitting up and by placing the hand beneath its clothes. It is equally useless to poke the abdominal wall with the tips of two or three fingers, as the muscles are provoked to action by this means also, and nothing can be felt behind them. Palpation can only be properly conducted by placing the warm palm perfectly flat and open upon the abdominal wall and by then making pressure at any part that requires examination with the flat of one or two fingers. Any abnormal tumours can in this way be readily detected and their edges defined—be they hepatic or splenic or what not. Splenic and renal tumours are best examined by one hand placed flat beneath the body supporting the flank, while the other, flat and open as before, makes pressure from above upon the abdominal wall supported by the hand behind.

Any **ejecta** should be examined, whether vomited or passed from the bladder or rectum.

The **sleep** of a child should be watched if opportunity offer. Healthy children sleep quite calmly, and for a long time at a stretch when the first few months have passed over and the necessity of frequent suckling has gone by, but ill-health at all times quickly disturbs. Slight attacks of fever, gastro-intestinal derangements, dentition, brain disease, &c., all make the sleep uneasy, although not much differentiation of disease can be accomplished by observations of this kind. It is a common symptom of illness, especially of exhausting diseases such as gastro-enteritis, for an infant to sleep with the eyes more or less open. The respiration during sleep even in healthy children is often periodic in its rhythm, approximating closely at times to the Cheyne-Stokes type, so that too much significance must not be attached to this symptom if observed during sleep. The pulse also is sometimes irregular in children during sleep. The manner of deglutition is another feature which will sometimes convey an indication of disease. In any interference with the freedom of respiration a child will take a few snatches of food and turn away with a splutter, or cough, or cry. If children refuse food without any definite reason, the mouth and throat should always receive a careful examination; stomatitis, tonsillitis, and even more serious troubles, such as post-pharyngeal abscess, may otherwise go unrecognised.

The **temperature** of children is often puzzling. It is much more unstable than in adults, and abnormal heat is more liable to escape notice. This is equivalent to saying that it causes less definite symptoms of illness. Temperatures of 102° and 103° are frequently overlooked in infants, the child being said to be simply out of sorts, and fretful. So also in children of two or three years old. The temperature of some children is disturbed much more readily than that of others. Some there are who, in the first six or eight years of life, whenever they eat anything at all indigestible, and often at other times from no very definite cause, suffer from an acute febrile disturbance, with cough and foul tongue. A mild aperient corrects the faulty process. Others again have sharp fever with a slight sore throat. A number of children have a simple continued fever of hectic type—viz., normal in the morning and up at night—which puzzles by the absence of all other symptoms, and raises false alarms of typhoid fever or tuberculosis. I will emphasise some of these remarks by a note of a case which will give the student an idea of some of the difficulties as regards temperature which are every-day realities in practice. A child of six years was taken suddenly ill, his symptoms being slight sore throat, a croupy cough, high temperature, and rapid pulse. His cough and sore throat gave ground for anxiety that an attack of diphtheria might be impending; but he persistently complained of pain in the epigastrium, and this, with a short catchy respiration, suggested the possibility of some diaphragmatic trouble. His mother, many years before, had had rheumatic fever, and a careful examination of the child's heart revealed an undoubted systolic prolongation of the first sound about the base, which was compatible with the existence of an early pericarditis, but hardly less so with the long and thick first sound which is one of the common accompaniments of sharp fever. The epigastric pain and peculiar breathing, with the altered heart-sound, and the family history, pointed to the possibility of the onset of acute pericarditis and rheumatism, while the sore throat and cough would also fit in with this presentation of the symptoms. On the other hand, the child was in no distress, nor did he appear to be seriously ill. He had a bright eye, a flushed cheek, dry red lips, a pungently hot skin, and a frequent short dry cough, at least as suggestive of pleurisy or pneumonia, and, with this idea in mind, there were some slight indications in diminished resonance at the left apex, and some questionable, because distant, bronchial breathing about the root of the lung, that acute pneumonia might have set in. Lastly, the children of this family were markedly excitable or neurotic. Such children, from inexplicable reasons, are liable to sudden sharp febrile attacks, in which cough and rapidity of pulse are prominent symptoms, and which closely simulate the onset of acute thoracic disease. The problem speedily solved will be the best practitioner who allows Nature to make for cure without heroic measures. Proper feeding ranks first in all treatment in early life.

Alcohol is a drug of which, perhaps, in the present day I may be allowed to say that it is of frequent and great use. It is not to be given generally or indiscriminately. But in cases of broncho-pneumonia, in severe febrile conditions, or after measles, diphtheria, and whooping-cough, when there is much exhaustion, it often seems to do good; and I should say the same of its use in the collapsed condition met with in infants in severe disease of chest or abdomen. In many of these cases, however, it is better to make trial first of small doses (two or three drops) of sal volatile frequently repeated and given with food, a remedy which I agree with Dr. Lewis Marshall in thinking is quite equal, if not superior, to alcohol in many cases. As regards the administration of alcohol, there are not a few parents who make objection if brandy or wine be ordered, but this difficulty may be readily solved by prescribing tincture of cardamoms or rectified spirit.

In children above the age of early infancy I like champagne. Its effect is more rapid in its action, and there is less of the drugging of alcohol left behind.

It is unnecessary to add that all drugs should be made as palatable as possible. Castor-oil and Gregory's powder may be very good remedies, but, except to babies, they are mostly disgusting, and there are now at hand numberless substitutes and methods of disguising nasty remedies which should be studied. Some may be put into lozenges, some into gelatine lamels or small pills, some into syrups, some can be mixed into a palatable emulsion, and so on.

Bleeding is an old-fashioned remedy which is perhaps not so much used as it should be. In severe lung disease, especially broncho-pneumonia, and in the heart disease of children, with its tendency to dilatation, especially of the right side of the heart, marvellous improvement sometimes follows bleeding. The most convenient method is by leeches, which may be applied over the sternum or over the liver; two or three may be used for an infant a year old, and in older children as many as six or even eight may be necessary. Actual venesection is apt to be difficult in a child, but in urgent cases blood may usually be drawn from the external jugular.

Subcutaneous infusion of saline solution is an extremely valuable resource in many of the acute diseases of infancy in which exhaustion and collapse threaten to prove fatal: the details of its use will be found described in the chapter on Diarrhœa (page 95).

Lavage or stomach washing is very useful in the treatment of vomiting in infancy; during the first year of life it is easily carried out, but in older children it is much less easy and for that reason less often practicable. The method of procedure is as follows: an œsophageal tube, specially made for infants, or in default of this an ordinary Jacques rubber catheter No. 12 or No. 14, is fixed on to the nozzle of a glass funnel, or still better to a short piece of glass tubing, the other end of which is connected with the glass funnel by a piece of rubber tubing. Immediately before use the œsophageal tube is warmed and lubricated by dipping it in hot water and then smearing a little glycerine over the lower two inches. The infant should be supported on the nurse's lap in a semi-recumbent position, the head should be supported on her left arm. The operator depresses the infant's tongue with his left forefinger, but should be careful not to put his finger far back on the tongue, for in this way retching is sure to be excited: with his right hand he directs the tube straight forwards and slightly downwards in the middle line, until the tube impinges on the posterior wall of the pharynx, when it will usually by its own flexibility curve downwards so as to pass without difficulty into the œsophagus: it is then pushed on quickly into the stomach. If the infant vomits beside the tube, as it may do, especially if too small a tube is used, it is usually wise to withdraw the tube at once, otherwise there is some risk of the vomited material being drawn into the respiratory passages, an accident which is happily exceedingly rare. After the stomach has in this way evacuated great part of its contents the tube can be passed again without risk.

The fluid which we have most often used for lavage is a solution of sodium bicarbonate, one or two grains to the ounce, but sodium chloride can be used similarly and in some cases seems more suitable. The temperature of the fluid should be 100° F., three to four ounces may usually be allowed to run into the stomach and then evacuated by lowering the funnel below the level of the patient, and this is repeated until the fluid comes back clear; so that fifteen ounces or more may be used altogether.

In conclusion, we may allude to **baths**, because their sphere of usefulness as a therapeutic agent is a large one. It would probably be difficult to enumerate the variety of diseases in which a bath is useful. As a general rule, when a state of pyrexia is recognised, the child is likely to be smothered to keep it warm. For the same reason the linen which is not actually soiled by the excreta is not changed for fear of chill. But children of all ages perspire freely, and in the course of a few hours will get exceedingly uncomfortable under these circumstances, fretting and becoming restless, whilst the mother worries at the unusual wakefulness. Put the child into a warm bath for a few minutes, and with fresh linen and a comfortable cot it will probably soon be at rest. Then, too, in most states of fever, sponging is of value—warm or tepid or cold, according to the necessities of the case—and a bath, even a warm bath, will reduce the temperature if it be very high. Tepid or cold baths may be administered to children in high fever, if requisite, but, if cold, the bath must be of short duration. A fall of temperature is set going by the immediate shock, not necessarily by prolonged immersion, and the latter is liable to induce a state of collapse and exhaustion such as is not often seen in adults.

For this reason I seldom make use of a cold bath, and never without anxiety. I prefer to exhaust the less severe measures first, such as those mentioned, or the continuous application of ice to the head, or an ice bag or pack to the surface of chest and abdomen.

The stimulant effect of a hot mustard bath is often valuable, especially in the collapsed condition which so often results from acute diarrhœa in infants; the mustard is used in the proportion of one brimming tablespoonful to every gallon of water; the mustard should first be mixed into a thin cream in a cup with a little tepid water, and then stirred into the bath-water, which should be at a temperature of 100° F. The infant should not be kept in the bath longer than three minutes; it should then be dried rapidly with a warm towel, and at once wrapped in a warmed blanket and put back into its cot, which must also be warmed with hot bottles. Sometimes a mustard pack is more convenient; the mustard and hot water are mixed in the same proportions and in the same way as for a bath, and the infant is wrapped for eight or ten minutes in a sheet wrung out of the mustard and water and covered over with a warm blanket.

An alkaline bath is occasionally of value in the treatment of some of the chronic irritative skin conditions which are met with in children, such as lichen urticatus; for this purpose one tablespoonful of ordinary washing soda may be used, dissolved in four gallons of water.

The tender skin of a child should always be a matter of attention. Poultices and hot bottles easily scald, and bandages are very liable to cut or excoriate if not carefully applied and frequently readjusted. Poultices are in frequent use for cases of thoracic and abdominal disease. They should never be so hot as to be in any degree painful. But I discard them as much as possible. They soon become cold, hard, and uncomfortable, and they are often heavy. A warm fomentation by means of spongiopiline, or flannel well covered in by cotton-wool, is in every way preferable, at any rate for acute diseases of the thorax, and the nurse should test before applying it by putting her lip to the surface. A jacket of wool or Gamgee tissue may be substituted later on.

viscera, particularly in the liver, heart, and kidneys, of infants who have died after about a week's illness. The symptoms consist of jaundice, the presence of blood in the vomit and stools, œdema and rapid wasting; this condition is sometimes called Buhl's Disease. In the other, which is known as Winckel's Disease, hæmoglobinuria or hæmaturia occurs, with intense jaundice and some cyanosis, followed by rapid prostration and death. The symptoms begin usually about four or five days after birth and end fatally within forty-eight hours. This condition has occurred in epidemics, and, like the former, suggests an infective origin.

Some degree of fine desquamation is usual during the first week after birth, and in some cases is very marked. The œdema which is occasionally met with in the newborn, and the diseases known as Sclerema and Pemphigus neonatorum, will be described in the chapter on Diseases of the Skin.

Breast Secretion and Mastitis.—The breasts of the newborn infant frequently secrete a small quantity of milk, beginning between the fourth and the sixth day after birth; this secretion is quite as frequent in males as in females, and in either sex may continue for several weeks; for instance, it is not very rare to find the breasts of a male child at the age of five or six weeks, or even later, full and prominent, and on squeezing them a few drops of milk run from the nipple. This secretion, which has been called "witches' milk," contains proteids with fat and sugar, as in mother's milk. As a rule, the secretion gradually ceases and the fulness of the breasts subsides without giving any trouble if left alone; but occasionally the breasts become inflamed, and the inflammation may even run on to a mammary abscess. Such inflammation and suppuration is specially likely to occur where some ignorant nurse has been squeezing and pulling the breasts "to break the nipple-strings," an absurd and mischievous popular superstition.

Umbilical Infection and Hæmorrhage.—The umbilicus requires the most scrupulous care and cleanliness until the separation of the cord is complete; this usually takes place about the fifth day. Until this has happened, and all rawness of surface has completely healed, the part should be treated with as careful antiseptic precautions as any surgical wound. It seems certain that infective conditions of various kinds may and do find an entry here, and to some of them the infant at this period seems to be particularly prone; erysipelas, suppurative peritonitis and general pyæmia, tetanus, and possibly those infective forms of jaundice to which allusion has already been made, may all be due to infection through the umbilical sore.

Sometimes bleeding occurs from the umbilical stump after the cord has separated. In the worst cases, on the fifth to the seventh day some oozing of blood from the umbilicus is noticed, or it may be more profuse bleeding; in either case it proves extremely difficult to arrest, and many cases prove fatal in a few hours or days. Such a condition may be associated with jaundice; indeed, Dr. J. Thomson quotes Grandidier as having noticed this association in fully two-fifths of the cases of spontaneous hæmorrhage in infants. If the application of cold and pressure fails to arrest the hæmorrhage a 1 in 20 freshly prepared aqueous solution of suprarenal extract should be applied on a swab of absorbent wool (tabloids containing five grains of the extract are prepared by Messrs. Burroughs and Welcome), or the solution of adrenalin chloride, diluted with an equal quantity of normal saline solution may be applied similarly. If these measures fail, it may be necessary to transfix the whole mass of umbilical tissues and tie them.

Spontaneous hæmorrhage from other parts is a rare occurrence in infants; it has been recorded from the stomach, the bowel, the vagina, the nose, and the kidney; it may occur with jaundice or as part of a general hæmorrhagic tendency, which passes off when the infant gets beyond the first few weeks of life. The extremely fatal condition which is known as Melæna neonatorum is in some cases perhaps part of such a general tendency; in others, however, it is associated with definite ulceration of the stomach or intestine (*vide* p. 107). Hæmorrhage into the suprarenal capsules has occasionally been associated with abdominal pain and collapse in newborn infants. In some cases the hæmorrhage has been sufficient to rupture the suprarenal capsule, and bleeding has occurred into the peritoneal cavity: death has occurred usually within the first six days of life, in one recorded case (Norris) death occurred on the tenth day. It is possible that in some of these cases the suprarenal hæmorrhage may have been due to violence during birth, but severe cases, especially if there is reaction of degeneration, the outlook is less hopeful, and the paralysis may be permanent; even if partial recovery occurs, there may be considerable shortening of the affected arm owing to stunting in the growth of the bone.

The condition should be treated on the same lines as an infantile paralysis, and the nutrition of the muscles maintained as far as possible by shampooing and massage of the affected parts. This treatment, which is to be preferred to electricity for so young a child, should not be commenced for at least six weeks after birth. A thorough examination of the part should be made in every case, to exclude the possibility of any fracture of bones or separation of epiphyses; for, as might be expected, these are sometimes found associated with the upper limb paralysis as a result of the same violence at birth, and call for immediate treatment by suitable fixation of the limb.

Facial Paralysis may also occur as the result of pressure during birth. In almost all cases the lesion is due to the blade of the forceps compressing the facial nerve. The paralysis is almost invariably unilateral, and is usually the only nervous lesion, but association with upper limb paralysis has been recorded (Roger). Henoch mentions the presence of a small ecchymosis in the parotid region in these cases:

A male child aged four weeks was brought to us for inability to suck: the face had been noticed to have a one-sided appearance directly after birth. Labour had been instrumental, and had lasted ten hours. The left eye could not be closed, the angle of the mouth was drawn down on the right side, the left cheek felt very flabby compared with the right. The mother thought that the paralysis was becoming less marked. The inability to suck was so complete that it was necessary to feed the child with a spoon.

The improvement which was already apparent in this case is the rule, and most cases make a complete recovery after a few weeks. A permanent paralysis is quite the exception. Prognosis must be guarded, for there is a form of facial paralysis which is congenital, but is probably central in origin; at any rate, there is no history of instrumental labour or of any difficulty in labour to account for it; and it would seem that there is little likelihood of recovery in such cases. No treatment is necessary as a rule in the form which is due to pressure ; in the other variety, treatment is probably useless, but it may be worth while to try the effect of galvanism.

In addition to these paralyses of peripheral origin, there are other forms of birth-palsy which are due to central lesions. These will be considered with the cerebral palsies of later childhood.

Œsophageal and Intestinal Obstruction.—There are many other abnormal conditions which are met with shortly after birth, but which present no special characteristics peculiar to this period, and may therefore more conveniently be considered with the same affections in older children. The various congenital deformities hardly come within the scope of this work, but we may refer here to two which cause urgent symptoms within two or three days after birth—congenital obliteration of the œsophagus and of the intestine.

With the former of these two conditions an infant, apparently healthy in every way, is noticed to regurgitate its milk unaltered a few seconds after it has been taken. The diagnosis is made by attempting to pass a sound or catheter, which is found to be arrested by an impassable obstruction about 5 inches from the lips. Life may be prolonged for a week or two by rectal feeding, but usually within a few days the infant dies of starvation and exhaustion. The pharynx in such cases has been found to end blindly, and to have no communication with the œsophagus, the upper end of which opens into the trachea.

Where a congenital occlusion of the intestine is present there is vomiting of bilious material with the food, the vomiting is persistent and the bowels have not been open since birth. When the obliteration is in the lower part of the bowel, there is likely to be considerable distension. The obstruction is, however, usually in the upper part of the small intestine. According to Silbermann, 42 per cent. are in the duodenum. No treatment is likely to be effectual : the child dies from exhaustion in a few days. In a case recorded by Henoch, where the obliteration was at the lower end of the jejunum, life was prolonged for fourteen days.

Much commoner than intestinal obstruction is imperforate anus, or atresia recti. The treatment of this condition falls

The latter are much to be preferred, as the temperature is regulated with much greater accuracy and kept more strictly uniform by the automatic arrangement, which also involves less constant attention.

Ventilation is secured by an outlet at the top of the box, and the incoming air from below must be moistened by passing over a wet sponge or in some such way. It is seldom necessary to use an incubator for more than from a few days to a few weeks; and the apparatus can now be hired from the makers, when it is not desired to purchase.* For premature infants born at the sixth or seventh month the use of an incubator is most important. The temperature used may be 90°–95° for the first few days, and then is gradually reduced until the infant is able to bear the temperature of the room. The incubator is valuable not only for premature infants, but also for other conditions associated with extreme depression of vitality; for instance, excellent results sometimes follow its use in severe cases of summer diarrhœa with much collapse in infants a few weeks old, and in some of the cases of marasmus in early infancy; it is useful also for such a condition as sclerema neonatorum, in which the body-temperature tends to fall below the normal.

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* Messrs. Arnold and Sons, Smithfield, or Messrs. Hearson and Co., 235 Regent Street, supply incubators.

CHAPTER II.

GROWTH AND DENTITION.

Growth.—The average weight of a healthy infant at birth is seven to eight pounds, the female being somewhat less heavy. For the first two or three days there is commonly some loss of weight, which may amount to as much as eight ounces; this is, however, quickly regained when the mother's milk-secretion is established.

The average gain per diem up to five months is three-quarters of an ounce to one ounce; a gain of 4–6 ounces per week may be taken as satisfactory progress in a healthy infant. But a uniform daily or even weekly progress is by no means the rule. We have frequently found at all periods of childhood that the increase in weight takes place by jumps, an increase being followed or preceded by a period of quiescence. The weight at birth is about doubled at five months and trebled at the end of the first year of life.

The gain in weight per annum for the first few years averages four or five pounds.

The average length of a child at birth is 19·5 inches. In the subjoined table of the monthly rate of increase the heights are according to Louis Starr*; the weights are after some observations by Pfeiffer:

Age.		Height.		Weight.
At birth	...	19·5 inches	...	7 lb. 8 oz.
1 month	...	20·5 "	...	8 " 5½ "
2 months	...	21 "	...	10 " 4 "
3 "	...	22 "	...	11 " 15 "
4 "	...	23 "	...	13 " 9¼ "
5 "	...	23·5 "	...	14 " 14½ "
6 "	...	24 "	...	16 " 3½ "
7 "	...	24·5 "	...	17 " 5 "

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* "Hygiene of the Nursery."

Age.		Height.		Weight.
8 months	...	25 inches	...	18 lb. 10 oz.
9 „	...	25·5 „	...	20 „ 1 „
10 „	...	26 „	...	20 „ 5½ „
11 „	...	26·5 „	...	21 „ 2 „
12 „	...	27 „	...	22 „ 7 „

"During the second year the increase (in length) is from three to five inches; in the third, from two to three-and-a-half inches; in the fourth, from two to three inches."

"A child in health generally gains twenty pounds in weight and ten inches in height in the first two years of life; in the third year four pounds and four inches are about the usual additions to weight and stature. During the next six years the body increases by annual increments of four pounds in weight and two or three inches in height. After ten years the body puts on flesh at the rate of eight pounds a year." *

For five years and onwards the figures both for height and weight have been worked out by Dr. G. W. Stephenson, whose table is subjoined.

AVERAGES OF HEIGHT AND WEIGHT OF BOYS AND GIRLS OF ENGLISH-SPEAKING RACES, CALCULATED FROM THE TOTAL OF BRITISH AND AMERICAN STATISTICS (STEPHENSON †).

BOYS.

Age.	Height in Inches.	Weight in Pounds.
5	41·30	40·49
6	43·88	44·79
7	45·86	49·39
8	47·41	54·41
9	49·69	59·82
10	51·76	66·40
11	53·47	71·09
12	55·05	76·81
13	57·06	83·72
14	59·30	93·46
15	62·27	104·90
16	64·36	120·00
17	66·20	129·19
18	66·81	134·97

GIRLS.

Age.	Height in Inches.	Weight in Pounds.
5	41·05	39·63
6	42·99	42·84
7	44·98	47·08
8	47·09	52·12
9	49·05	56·28
10	51·19	62·17
11	53·26	68·47
12	55·77	77·35
13	57·96	87·82
14	59·87	97·56
15	61·01	105·44
16	61·67	112·36
17	62·22	115·21
18	62·19	116·43

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* Dr. Angel Money in Keating's "Cyclopædia of the Diseases of Children," p. 53.

† "On the Relation of Weight to Height and the Rate of Growth of Man." G. W. Stephenson, M.D., *Lancet*, 1888 vol. ii. p. 560.

The circumference of the head is sometimes of importance, especially in connection with some abnormal conditions of the brain. From observations which were made at the Hospital for Sick Children, Great Ormond Street, the average maximum circumference was found to be :

At	3 months	15·2	inches.
"	6 "	16·4	"
"	12 "	18·0	"
"	3 years	19·0	"
"	6 "	19·8	"
"	8 "	20·5	"
"	12 "	20·7	"

The anterior fontanelle closes usually at about the eighteenth month, but the date of closure varies considerably in children in health.

Dentition.—The milk-teeth, twenty in number, are cut in the following order :—The two lower central incisors from the seventh to the ninth month, often later and sometimes earlier. After a lapse of five or six weeks come the two upper central incisors ; next come the two lower lateral incisors, followed by the upper lateral incisors. After an interval, the four front molars appear, followed again by the four canines, and last of all by the four posterior molars, the whole set being cut by about the end of the second year. But it must not be supposed that there is any strict time-keeping in the appearance of the teeth, for, although there is a pretty definite order of occurrence, the lower central incisors may appear early or late, and the others may follow, sometimes several at once, sometimes with long intervals between them. It often happens that the four central incisors are cut, an interval follows, and then with steady progress come all the rest save the last four molars, the appearance of which may, even in healthy children, be deferred for three or four months over the average age of two years.

Dentition is usually held to be the cause of many ailments, but to what extent it is really so is doubtful. The time of dentition is one of transition. A uniform and bland diet is being changed for one of greater variety, and the febrile attacks, diarrhœa, and vomiting which are so rife at this time are more satisfactorily explained by indigestibility of food than by any occult influence of tooth-cutting. This much, however, may be allowed: that the growth of a child is one of stages; that there are periods during which unusual progress is made; and that the period of dentition is one of these. Increased activity of all the physiological processes at work necessarily implies greater risks of friction between one organ and another, or even of a regular break-down. Excessive energy, if not properly regulated or adequately expended, is liable to lead to an explosion of some sort or another. Some such general hypothesis as this must hold good for the instability of working which is common in all the viscera during the first dentition, and to a less extent during the second dentition and in the years which usher in puberty. In this general sense the time of dentition is no doubt a time of peril. The mortality is high, and of disorders of many kinds—convulsions, bronchitis, pneumonia, diarrhœa, &c.—each claims its victim. But this is not as a consequence of the eruption of the teeth, but as part of a general activity of growth and development, to which dentition and morbid phenomena both in a sense respond.

Still there are, no doubt, certain minor evils attending dentition which require at least a mention. Some children are remarkably susceptible to "colds" under such circumstances—that is to say, as each tooth comes through the gums the child suffers from coryza; the eyes run, the nose also; there is much sneezing, and perhaps a little cough. There may be at the same time pyrexia, and the bowels become irregular—now confined and now relaxed. Some get a sharp attack of fever (temp. 103° or 104°), the cheeks being flushed, the lips and tongue becoming a bright red, and the child restless and fretful. Others have diarrhœa at these times; others, again, convulsions, and a still larger number have threatenings of convulsions in the form of wildness and excitement of manner, more irregularity of muscular movement than usual, temporary contracture of feet and hands or strabismus. Most children at this time have an excessive dribbling of saliva, are frequently biting anything they can put their hands to, and there may be a little superficial ulceration of the mouth. Indigestion is common. The child suffers with heartburn and offensive eructations, while lichen urticatus (strophulus) appears upon the skin. Convulsions are not a common ailment of dentition *per se*, and it is the opinion of

West, Henoch, and many other observers, that they are but seldom seen except in association with rickets.

The dribbling of saliva is a most interesting phenomenon, whether it is due to the irritation of the teeth or to the physiological activity of growth to which I have already alluded. And I may here add, as a hint derived from the late Mr. H. Moon, at one time dental surgeon to Guy's Hospital, that there are divers peculiarities in the character of the saliva in various digestive and other ailments. This we know in the dryness of mouth which occurs in some diseases, the acidity which occurs in others. And Mr. Moon was wont to tell of a peculiar viscidity of the secretion which is pre-eminently detrimental to the dental enamel.

In the treatment of these varied conditions, to be forewarned is to be forearmed, and the timely management of slight disorders in all probability arrests more serious evils. To control the excess and irregularity of muscular movement is probably to avert the development of a pronounced convulsion. The "cold" neglected becomes a bronchitis or pneumonia; the indigestion leads to vomiting and diarrhœa; the slight feverishness to severe pyrexia. The treatment may seem somewhat empirical, nevertheless simple means suffice in most cases; contractures of feet and hands and other threatenings of convulsion will often speedily subside on the action of some mild aperient —a small dose of calomel or a couple of grains of hydrarg. cum cretâ with a similar dose of pulvis rhei. The coryza is suitably treated by a little ammonia and ipecacuanha; the fever by a drop of tincture of aconite or a little salicylate of soda with acetate of ammonia (F. 3), and so on.

If the pyrexia be severe, and there be any threatening of convulsions, and a tooth seem to be worrying the gum close beneath the surface, there can be no harm in using the gum lancet to relieve the upward pressure; at the same time, bromide of potassium or sodium, and some saline, such as citrate of potash, should be given internally either as a nocturnal draught or twice or three times a day, and Rilliet and Sanné speak highly of valerianate of ammonia: phenazone is useful also in such cases and may be given in doses of half a grain at six months, and one grain at twelve months two or three times daily.

But the teeth are not to be considered only in the light of provoking disease; they also suffer from various constitutional and other affections. Thus they are known to be late in eruption in the subjects of rickets; the permanent set are stunted and deformed in some cases of congenital syphilis; and stomatitis is believed by some to ridge the enamel in the same way as serious illness will produce a transverse line upon the nails.

The subject of dental decay, however, although one of interest and concern to all who see much of the diseases of children, is hardly within the province of this book. Moreover, beyond confirming the general observation that decay takes place much more rapidly in some families than in others, I have not anything positive to contribute to the subject. But I may make this practical note from the storehouse of the experience of my late colleague, Mr. Moon, that young children are often inveterate food-bolters, on account of toothache; and this much from my own knowledge, that stopping is now practised by dental surgeons from four years of age upwards, thus allowing of the more healthy development of the permanent teeth, and in no small measure preventing some of the many dietetic ailments of early life.*

The second dentition commences when the child has reached the age of six years with the eruption of the first molars. The following table gives approximately the dates of appearance of the thirty-two permanent teeth:

First molars	6 yrs.
Central incisors	7 "
Lateral incisors	8 "
First bicuspids	9 "
Second bicuspids	10 "
Canines	11–12 "
Second molars	13–14 "
Third molars	17–25 "

Some have thought that this also is a time of hazard to the child, but it will be admitted by all that, whatever may be the precise value of the eruption of the milk-teeth as a factor in the production of disease, the appearance of the permanent teeth is only chargeable, if at all, in the most indirect manner. The more obvious reasons that are present in the former case are absent now: there is no change of diet, no special development commencing now, at all comparable with that which takes place during the first dentition. It is a time when education begins in earnest, when growth in most cases is proceeding rapidly, and therefore a time when there are many risks, though probably in most cases independent of dentition. Sir W. Gowers, from an analysis of a large number of cases of epilepsy, does indeed show that the numbers rise at seven years of age—the commencement of the second dentition—and fall again in the next few years preparatory to a further rise at puberty. And Mr. Nunn, consulting surgeon to the Middlesex Hospital, tells me of more than one case of epileptiform convulsions occurring during the second dentition within his own knowledge, apparently arrested by the lancing of the gums. Mr. Nunn has also seen corneal ulcers of similar origin; * and Rilliet and Sanné insist upon the occurrence of various neuralgic affections of head and face—a nervous cough (particularly in girls) and a lienteric diarrhœa. Still it seems not unlikely that liabilities of this sort are, most of them, to be referred to the extra calls which, at this time of life, are made in any case upon brain and body, rather than to the process of dentition; and apart from epilepsy, chorea, and neurotic diseases generally, there are none which attach themselves peculiarly to this period.

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* I would here call attention to "The Diseases of Children's Teeth," by Mr. R. Denison Pedley, dental surgeon to the Evelina Hospital for Sick Children. It is a book that contains much useful information.

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* Mr. Nunn collected his experience on this head into a paper read before the Association of Surgeons practising in Dental Surgery, March 1877, and he has been good enough to allow me to peruse his unpublished MS.

CHAPTER III.

INFANT-FEEDING: BREAST-FEEDING—WET NURSING—WEANING.

The student often starts in practice with such limited notions on the subject of diet, that many a mother knows more of what is actually required than he does. True, indeed, the fundamental rule upon which all practice is founded, that the mother's milk, and that only, should form the infant's food for the first few months of life, is a choice stock-in-trade, but we soon find out how very limited and often at fault is this statement of the matter. Many mothers cannot, many mothers will not, nurse their infants at all, and many more are so situated through the calls of society or of employment, that this, the chief of maternal duties, can only be fulfilled in part. While, therefore, it is incumbent upon the medical man to insist upon the paramount importance of a mother's fulfilling her duty in this respect, he must be prepared not only to advise on the details of breast-feeding, and to discriminate between the cases in which an infant should be suckled and those in which it should not, but also to give the fullest guidance where, from any reason, the natural method of feeding is not available.

It will be well to consider first Nature's method of infant feeding and then to pass on to the much more troublesome problem of artificial substitutes.

Colostrum.—For the first two or three days after parturition the mother's breasts secrete a milky-looking fluid which is called "colostrum." This is secreted only in very small quantity, but is sufficient for the needs of a healthy infant until it is replaced by the more abundant secretion of milk. It is richer in proteid than the mother's milk, and we have known the curd given by colostrum to be almost as large as that from cow's milk, though much less firm; usually, however, the curd is finer than this, though coarser than in the later milk. The colostrum contains a very low proportion of fat; in ten samples, which we examined, the average percentage was 2·4, and in some it was as low as 1 per cent. The proportion of sugar is also low. The specific gravity is about 1040.

Microscopically the characteristic difference from the later milk is the presence of the so-called colostrum corpuscles, large, round or ovoid cells with a granular appearance; these disappear gradually as the milk-secretion is established, but may be found as late as the end of the second week. The colostrum evidently has some value as a food; it is usually said to have some laxative effect also, which however would seem to be very slight.

Human Milk.—This is the only perfect food for infants, and as all our efforts in the case of artificial feeding are directed to the imitation of it, it is essential that we should have a clear conception of its composition and characters. It is a creamy-white fluid with a sweet taste, a specific gravity of about 1030, and a neutral or faintly alkaline reaction. Microscopically it is seen to consist of a colourless plasma in which float fat globules of various sizes. In chemical composition its chief constituents are proteids, fat and sugar; the proteids, as in cow's milk, are of two kinds, casein and lactalbumen; the former is precipitated by acids and by the rennet of the gastric juice, the latter is coagulated by boiling but not by acids.

The average proportions of the various constituents may be stated in percentages thus:

Proteid	Casein ·6 Lactalbumen 1·4	2·0
Fat		3·5
Sugar		7·0
Salts		·2
Water		87·3

The proteid in this analysis is seen to consist chiefly of lactalbumen, the curd-forming casein forms only a very small part of the proteids present, and the practical result of this is evident, when we add a few drops of acid to a sample of breast-milk; the resulting curd is so extremely fine that the appearance of the milk is only slightly altered, a feature in which it differs widely from cow's milk.

Last but not least among the properties of human milk must be mentioned its almost invariable freedom from micro-organisms, a point of no small importance in the feeding of infants.

As regards the quantity of milk secreted, it has been estimated that the mother supplies to her baby about half to three-quarters of a pint in the twenty-four hours in the first week or two, and that this gradually increases until, in the later months of lactation, a daily average of about two pints is reached.

Breast-feeding.—During the time which precedes the appearance of the milk the infant should be put to the breast both for the reason which more nearly concerns the obstetrician, that suckling promotes contraction of the uterus, and also for the nourishment which it may obtain from the colostrum: the infant should be suckled about three times on the first day, and at intervals of four hours on the second day, when the milk-secretion is established regular feeding at intervals of two hours must be commenced. From this time onwards the infant must be fed from its mother's breast, and if possible from that alone, for the full period of lactation, which in most cases will be about nine months.

The infant is to be put to the breast every two hours for the first five or six weeks, between the hours of 6 A.M. and 10 P.M. and afterwards the interval between the meals is to be lengthened gradually, till a three-hour interval is reached (*see* p. 66). It is said that a healthy child will sleep all through the night hours, but in the first five or six weeks of life it will require food several times during the night. Even when infants are some months old, one meal in the middle of the night may be necessary, and to this there is but little objection. The digestion of a healthy infant is rapid, and while food should never be given too often, any lengthened fast is equally to be avoided.

The **interval** between meals is to be strictly enforced for all infants that are healthy. Children are creatures of habit, and soon learn their proper meal-times. They will often, indeed, begin to cry punctually at the time. But they are easily educated also in faulty habits. It is the custom of many mothers to pacify crying at all times with the breast or the bottle—and a more pernicious practice it is impossible to conceive. The more the crying the more the feeding, and the more the feeding the more the infant cries, and what between crying and suckling the day and night are spent in misery. These are the cases which form the great majority of the thin, pining, pitiable mites who are brought to a hospital for " consumption of the bowels," but with bad feeding only to blame. And what wonder! If grown-up persons were to be always eating, who among us would not be dyspeptic, and who would not be quite as miserable, if less demonstrative than the infant! Now let it be remembered that there are many children who, in the first month or two of life, when the stomach is, as it were, unfolding to its duties, cry a good deal. They are a source of great discomfort and pain in a household—sucking at something will almost certainly quiet them, and other methods of treatment, food, doctoring, and so forth, often fail. It is very important in such cases to impress upon the mother and nurse that, if they quiet a child by illicit means, they are but sowing the wind to reap an inevitable whirlwind. If they bear with it for a short time, the child soon becomes accustomed to the habits enforced; it must sleep after a while, and the first lesson of its life is learned.

The time taken at the breast should be about fifteen minutes; some infants, especially if the milk flows readily, suck so rapidly that they will empty the breast in less than ten minutes, with the result that they suffer from flatulence and colic, or from vomiting; the mother must prevent such overhaste in suckling by compressing the nipple between the forefinger and middle finger of the disengaged hand, and so regulating the flow of the milk; the palm of the hand can be used at the same time to support the breast at the child's mouth.

Variations in Breast Milk.—Whenever there is much crying, attention should be directed to the character of the milk. Both the quantity and the quality may be altered by any disturbance of the mother's health; worry or emotional upset, menstruation, over-fatigue, any of these may cause the milk to disagree with the infant; diet also has considerable influence on the milk-secretion, and it is often possible to modify the milk to some extent by altering the mother's food.

Probably the commonest faults are deficiency in quantity or poorness in quality of the milk. The former leads to a passionate hungry cry, which, to the experienced ear, is very different from the cry of pain, and when the infant is put to the breast it sucks vigorously for a few minutes, and then rejects the nipple and cries pettishly when it finds itself unable to obtain more milk.

Sometimes the flow may be increased by a more liberal diet for the mother ; sometimes, after a thorough rest, in bed if necessary, for a day or two, the milk will return ; and sometimes we have found the taking of malt extract to have the desired effect. A glass of stout or ale once a day is sometimes beneficial, but in some cases it seems to alter the quality of milk in some way so that it disagrees with the infant.

A thin and watery milk not only fails to nourish the infant, but also causes flatulence, and the child cries because its stomach is a wind-bag. In this case also the mother's diet probably requires revision, and an increase of proteid food in particular, such as meat, fish and eggs, is specially valuable in increasing the proportion of fat in the milk ; worry and fatigue must be avoided as far as possible, for in some cases they appear to be responsible for the poor condition of the milk.

The milk may be over-plentiful, and the child taking it too greedily and rapidly, is troubled in consequence with vomiting or colic. To some extent this can be remedied by the simple mechanical expedient of compressing the nipple between the fingers as described above; in this way the rate of flow may be controlled, and the child prevented from emptying the breast too quickly. The quantity of fluid taken by the mother should be diminished, and in many cases more exercise must be ordered.

In any given case, especially when the milk suddenly begins to disagree, the possibility of drugging may have to be considered, for it occasionally happens that drugs taken by the mother are excreted in the milk in sufficient quantity to have an injurious effect upon the infant. The drugs which appear in the milk in this way are the salicylates, belladonna, atropine, arsenic, potassium iodide and bromide, the saline purgatives, and possibly opium and morphia.

Whatever may be the fault in the milk—and it will often require the utmost care to detect what is wrong—we wish to emphasise the importance of making every effort to correct the faulty condition before advising that the child should be weaned. Partial breast-feeding is better than none ; and it is often possible, by the addition or substitution of one or two artificial feeds in the day, to get over the difficulty and continue the suckling; for instance, a deficiency of fat in the breast-milk may be met by the daily addition of one or two feeds of cream and whey, and an undue richness in curd by the administration of a tablespoonful of lime-water or plain water just before each breast-feed.

In a certain number of cases, however, in spite of all our efforts, the breast-milk persistently disagrees with the infant, and this sometimes when the milk even on careful examination seems to be of excellent quality. Under such conditions weaning may be inevitable.

Conditions contra-indicating Breast-feeding. — It is not, however, only on the character of the milk that the question of suckling or not suckling must be decided. There are certain conditions in the mother which may make it injurious either for her or for the child. Some women are not strong enough to bear the drain on their strength which suckling involves. Too often, unfortunately, this is put forward as an excuse for shirking an irksome duty, and the doctor must exercise his discretion, balancing the very considerable risks and difficulties of artificial feeding against any possible risk to the mother's health in suckling.

The presence of tubercle in the mother usually contra-indicates breast-feeding, although the risk of infection by the milk is probably infinitesimally small. Certainly, when there is any active pulmonary tuberculosis in the mother, she should not be allowed to suckle her child, for the close contact which suckling necessitates certainly involves a risk of infection quite apart from its conveyance by milk. Moreover, it would seem that lactation has some influence in stirring up the tuberculous process to greater activity, and so may be disastrous to the mother.

Congenital syphilis in the infant is no reason whatever for weaning; indeed, it is usually a very strong reason for not weaning, as these infants are so often puny and marasmic that their chances of survival will be much diminished if they are deprived of their mother's milk.

Whether an infant with congenital syphilis should ever be suckled by a wet-nurse is a different question, and should certainly be answered in the negative, for in this case the nurse is not protected as the mother is, and although there may be some difference of opinion as to the contagiousness of congenital syphilis, so long as there is any doubt a wet-nurse should never be allowed to suckle a syphilitic infant.

Acquired syphilis in the infant—a very rare condition—absolutely prohibits suckling whether by mother or by wet-nurse.

Various acute illnesses may make breast-feeding impossible, and even if the mother is able and anxious to do so, she should not be allowed to suckle her infant while her temperature is raised by such conditions as puerperal fever, influenza or other infective conditions.

The reappearance of the menses during lactation is not *per se* a reason for weaning; but if it affects the milk sufficiently to make it disagree with the infant—and it would seem to have some influence, particularly in increasing the proteids—it may be necessary to stop suckling for two or three days, using artificial food instead, or in some cases to wean altogether. Pregnancy during lactation usually makes it advisable to wean, at any rate by the time the pregnancy has reached its third month.

Wet-nursing.—When the mother is unable to suckle her infant, the question of wet-nursing may have to be considered, and it is a question with many sides. It may be as well to say at once that, in our opinion, so long as we have to do with children who have not persistently wasted for some time, careful artificial feeding will seldom fail. This is the more to be insisted upon both as a hope and as a motive for perseverance, since wet-nurses are in many families—perhaps in most—an impossibility. They are difficult to obtain just when they are required; they are a considerable expense; they introduce a sudden and dominant influence into many a household, for which it finds itself unprepared—not to mention the moral considerations, which are too often obtrusive. If, however, it is decided to try a wet-nurse—and there are undoubtedly cases in which this method of feeding offers the one hope of saving the child—the nurse must be examined with scrupulous care before she is engaged. Inquiries should be made for any previous symptoms indicative of syphilis; the skin and throat should be examined for scars, &c.; the chest, to make sure of the absence of phthisis. The wet-nurse's child must also be examined carefully; in one instance where other things seemed in favour of engaging the nurse we found that her infant had a syphilitic rash; and the impossibility of excluding congenital syphilis in the infant during the early weeks of life makes it advisable that in no case should a woman be engaged as wet-nurse until her infant is at least eight weeks old, by which time if syphilis is present it will probably have shown itself. It may perhaps be advisable that, where there is a choice, a nurse should be chosen of similar complexion to the infant, and whose child is, as nearly as the above proviso will admit, about the same age as that to be nursed. The state of the breasts must be examined, their distension, the state of the nipples, and the quantity and quality of the milk. It is well, too, to be prepared with a second nurse, as the first selection may after all fail in some way or another. Infants, as well as their parents, have unaccountable likes and dislikes.

Weaning.—At what age should an infant be weaned? The answer to this must depend on the circumstances of each individual case. As a general statement one may say that an infant should be weaned at nine months; but there are many cases in which weaning must be postponed until a little later, and some in which it may be done earlier with advantage.

It is much better to wait a few weeks longer, if by this means we can avoid weaning the infant during the hot summer months, when diarrhœa is prevalent. It is well also to avoid weaning during any temporary disturbances, be it by a troublesome tooth, a little bronchitis, or some transient gastro-intestinal trouble. In most cases weaning should be done gradually; two artificial meals at first may be substituted for breast-feeds during the day, and as the infant becomes accustomed to the new food, more and more of the breast may be replaced by artificial feeding, until at the end of three or four weeks weaning is complete. Occasionally an infant will obstinately refuse to take its food in any way except from the mother's breast. Under these circumstances it may be necessary to wean abruptly and to keep the child away from the breast for a few hours until hunger induces it to accept the new way of feeding.

CHAPTER IV.

INFANT-FEEDING (*continued*): ARTIFICIAL FEEDING—PROPRIETARY FOODS.

For one reason or another in many cases Nature's method of feeding is not available and some substitute must be found. As every one knows, all sorts of concoctions are abroad which are supposed to outdo Nature in appropriateness of composition and directness of aim; some of these are wholly unfit for infants' food and need no mention here; others have their value in particular cases, and will be considered hereafter: the one substitute which from its ready accessibility and general resemblance to human milk forms the most satisfactory basis of all hand-feeding is cow's milk. Cow's milk, however, presents certain important differences from human milk, and for the rational feeding of infants it is essential not only to know the characters of cow's milk, but also these points of difference.

Cow's milk, like human milk, consists of a colourless plasma containing fat globules in suspension. As it reaches the infant, cow's milk is generally acid, and has a specific gravity of 1029–1035. Chemically the same constituents are present as in human milk, but in different proportions, as can be seen from the following comparison of the average composition of the two milks:

Cow's Milk.				Human Milk.	
Proteid	Casein 3·25 Lactalbumen ·75	4·0	...	Casein ·6 Lactalbumen 1·4	2·0
Fat		3·5	...	Fat	3·5
Sugar		4·0	...	Sugar	7·0
Salts		·7	...	Salts	·2
Water		87·8	...	Water	87·3

Many analyses have been made, and with varying results, but they all come to this, that cow's milk is very rich in casein and poor in sugar; and it is this excess of the curd-forming casein which is responsible for so much of the difficulty in feeding with cow's milk. The large solid lumps of curd which are formed in cow's milk on the addition of an acid are in striking contrast with the extremely fine precipitate which occurs in human milk.

The presence of micro-organisms in cow's milk is a further point of difference, which necessitates special precautions in its use for the feeding of infants.

Milk Mixtures.—The pattern of all infant foods must be human milk, and therefore in adapting cow's milk to our purpose our aim is to neutralise as far as possible the differences which exist. This has been attempted chiefly by two methods: (1) By simple dilution. (2) By interfering with the process of the coagulation of the casein.

It is obvious that by simple dilution with an equal quantity of water the proportion of proteids as a whole can be made the same in both, but the proportion of casein will still remain far in excess of that in human milk, and as the curd is the chief difficulty in digestion it is often necessary to dilute still further so as to bring the proportion of casein somewhat nearer to the standard. Dilution with two parts of water will reduce the proportion of casein to one-third of its original amount, but even so it will still be in excess of that in human milk, and it can easily be understood therefore why so many infants are unable to digest cow's milk unless the dilution is very considerable. But in reducing the proportion of proteids we necessarily reduce also the proportion of fat and of sugar; so that the fat which originally was up to the standard of our pattern now falls below, and the sugar which was already deficient becomes even more so.

It is necessary, therefore, to add both fat and sugar to correct these proportions. The former can be accomplished by the addition of cream, the latter by the addition of cane-sugar or, still better, of milk-sugar.

To obtain accuracy in the percentage of fat it would be necessary to use a standardised cream, but this is rarely available, and if it be remembered that the ordinary centrifugal cream sold in most large towns contains roughly 48 per cent. of fat, it is easy to calculate the amount required: a teaspoonful (one drachm) of such cream to every 3 ounces of any milk-and-water mixture means the addition of 2 per cent. of fat, and for practical purposes, whatever dilution of milk may be used, this addition will be found to give a sufficiently accurate proportion of fat. Similarly the addition of a level teaspoonful of milk-sugar to every 3 ounces is found to add about 5 per cent. of sugar, so that a fairly accurate percentage can be arrived at by careful calculation in any given mixture; but for practical purposes, with any ordinary dilution of milk this proportion of added sugar will give a satisfactory result.

Simple dilution, however, may not be sufficient; the child may still be unable to digest the firm curd of cow's milk; under these conditions an attempt may be made to render the curd smaller and less firm, or at any rate to increase its digestibility by the use of certain diluents which are thought to have this effect. Instead of adding plain water to the milk, barley-water, oatmeal-water, rice-water and gelatine are used as diluents. Exactly how these act is perhaps open to question. It was thought formerly that the use of thickened fluids as diluents interfered mechanically with the firmness of the curd and so favoured digestion, but experiments made by Rotch seem to throw considerable doubt upon the action of substances of this sort. However this may be, we think there can be no doubt that an addition of this kind to cow's milk is often distinctly useful and enables an infant to digest and thrive upon the milk, when without it feeding is associated with pain, the motions are pale and lumpy, and contain undigested curd, and progress remains at a standstill.

Barley-water has only an insignificant nutritive value in itself; its value in this direction is almost entirely in facilitating the digestion of the milk and so assisting nutrition; but it must be remembered that barley-water contains starch, albeit in infinitesimal quantity (about 1 per cent.), and even this amount of starch will sometimes disagree with an infant. It has a distinct laxative effect, which may indeed be useful for many infants whose tendency is to constipation, but, on the other hand, may do harm by producing or keeping up a troublesome looseness of the bowels. Some infants are very sensitive to the administration of starch in any form, and we have repeatedly known a rawness and redness of the buttocks to appear after perhaps only one or two meals treated in this way.

Rice-water is less laxative than barley-water, and for this reason is sometimes more useful; *oatmeal-water* is less starchy than barley-water, and may be preferable on this account but, like barley-water, it has some laxative effect. A thin *gelatine jelly*, a teaspoonful to half a pint of milk and water, may be mixed with the food instead for the same purpose, but the diluents already mentioned will be found more valuable. For details of these preparations, *see* Appendix.

Lime-water is often added to a mixture of milk and some other diluent; it seems to assist the digestion of casein in some cases, but whether its good effect is due to its neutralising the acid of the milk, or whether it has any value in diminishing the size of the curd, seems uncertain. It should be added in the proportion of about one tablespoonful to a three-ounce mixture. It is often more convenient to use the stronger liquor calcis saccharatus, of which ten drops should be added to a three-ounce feed.

Solution of Sodium Citrate has recently been suggested by Dr. F. J. Poynton as valuable for reducing the firmness of the curd and so increasing the digestibility of cow's milk. It is used in the proportion of gr. i–ij for every ounce of milk, and as the sodium citrate is readily soluble in water the whole amount required for each feed can be prescribed in one drachm of water. If, for instance, it is decided to use one grain of sodium citrate to each ounce of milk, and feeds are being given of milk 3 ounces, water 2 ounces, a solution of sodium citrate is ordered containing 3 grains to each drachm, and the mother is directed to add one drachm of this solution to each feed. In some cases where the infant had difficulty in digesting curd we have found this method decidedly helpful.

By carefully correcting the proportions of the three important constituents of cow's milk, namely, proteids, fat, and sugar, it is possible to adapt it to the needs of most infants; and this is no very difficult matter, for the proportions of fat and sugar on which an infant will thrive at any time are indeed almost constant, namely, 3–4 per cent. of fat and 6–8 per cent. of sugar; the only difficulty in most cases is the proportion of proteids, the soluble lactalbumen is digested easily enough, but the proportion of casein which can be digested varies, not only at different ages, but also in different cases, and it may require to be reduced almost to a vanishing-point before an infant will digest cow's milk.

The matter has been simplified for those who can afford it by the establishment of milk laboratories in connection with some of the large dairies, where milk is made up with the required percentage of its different constituents according to the prescription of the medical man. The Walker-Gordon Laboratory (London Branch: 79 Duke Street, Grosvenor Square) supplies such milk, and also a standardised cream (20 per cent.) for the home-modification of milk.

The following table (issued by the Walker-Gordon Laboratory) shows the average proportion of each constituent which has been found useful at different ages:

Week of Life.	Quantity at each Meal in Ounces.	Percentages.		
		Fat.	Sugar.	Proteids.
First	1¼	2·00	4·50	0·75
Second	1¾	2·50	5 50	1·00
Third	2	3·00	6·00	1·00
Fourth	2¼	3·00	6·00	1·00
Fifth	2¾	3·25	6·50	1 00
Sixth	3	3·25	6·50	1·25
Seventh	3	3·50	6·50	1·25
Eighth	3¼	3·50	6·50	1·25
Nine–Eleventh	3½	3·50	6·50	1·25
Twelve–Thirteenth	3¾	3.50	6·50	1·25
Fourteenth	4	3·50	6·50	1·25
Fifteenth–Sixteenth	4¼	3·75	6·50	1·25
Seventeenth–Eighteenth	4½	3·75	6·50	1·50
Nineteenth-Twenty-first	4¾	3·75	6·50	1·50
Twenty-second–Twenty-third	5	3·75	6·50	1·50
Twenty-fourth–Twenty-fifth	5¼	3·75	6·50	1·75
Twenty-sixth	5½	3·75	6·50	1·75
Twenty-seventh	5½	4·00	6·50	1·75
Twenty-eighth	5½	4·00	7·00	1·75
Twenty-ninth–Thirtieth	5¾	4·00	7·00	1·75
Thirty-first–Thirty-second	6	4·00	7·00	1·75
Thirty-third	6¼	4·00	7·00	1·75
Thirty-fourth–Thirty-sixth	6¼	4·00	6·50	2 00
Thirty-seventh–Thirty-ninth	6½	4·00	6·50	2·00
Fortieth–Forty-first	6¾	4·00	6·50	2·00
Forty-second	7	4·00	6·50	2·00
Forty-third	7	4·00	6·50	2·25
Forty-fourth–Forty-fifth	7	4·00	6·00	2·50
Forty-sixth–Forty-eighth	7¼	4·00	6·00	2·50
Forty-ninth–Fifty-first	7¼	4·00	6·00	2·75
Fifty-second	7¼	4·00	5·50	3·00

Fresh milk modified in this way is, in our opinion, much to be preferred to the preparations which are sold as "humanised milk;" these, for obvious commercial reasons, are sterilised, and there can be little doubt that the process of sterilisation at high temperatures in some way interferes with the nutritive value of milk.

A difficulty in obtaining reliable fresh cream, or the question of expense, often makes it necessary to give simply diluted milk, to which sugar is added in the proportion mentioned above; the dilution must be sufficient to bring the proportion of casein within the digestive power of the infant.

As a rough guide the following table may serve to indicate the proportions of milk to diluent which should be used at the different ages:

	Milk.		Diluent.
First week	1	:	3
Second week to sixth week . .	1	:	2
Sixth week to three months . .	2	:	3
Three months to five months . .	1	:	1
Five months to seven months . .	3	:	2
Seven months to nine months . .	2	:	1
Nine months to twelve months . .	3	:	1

Some infants, however, can digest casein better than others, and if no cream is added the least possible dilution should always be used, as it must be remembered that in all such mixtures of milk and water the fat is also diluted and therefore necessarily deficient.

In considering the modification of cow's milk, it is customary at present to speak of the proteid, fat, sugar, and salts as if on the proportion of these alone its properties depended; but it is well to recognise that there are other factors in the problem notably the several ferments which have recently attracted attention in milk, and which no doubt ought to be taken into account if we knew more about their function and in particular about their influence on digestion. This much, at any rate, seems clear that no mere mixture of so much milk-proteid, -fat, and -sugar, however accurate the proportions, reproduces human milk.

Whole milk.—In curious contrast with the elaborate methods which have been devised for so modifying cow's milk that it shall resemble human milk as exactly as possible in its percentage composition, is the success which sometimes attends feeding with cow's milk undiluted and unaltered in any way except by pasteurising or boiling: some healthy infants and some even who have fallen into a state of marasmus from inability to digest diluted milk, will flourish on this whole milk.

The use of undiluted milk for infant feeding must necessarily be tentative, it can hardly be regarded as suitable for routine adoption, and it is difficult to give any exact indications for its trial: healthy infants only a month old will sometimes thrive on it, and we have had success with it in the digestive troubles of infants less than three months old. If it is decided to try this method of feeding it is wise to begin with about half the quantity which would be suitable at the age with ordinary milk-mixtures, and gradually to increase up to about two-thirds of this quantity.

Cream Mixtures.—In the feeding of infants cream is valuable not only as an addition to milk to supply deficiency of fat, but also as a substitute where ordinary milk cannot be digested. Cream, it must be remembered, is simply milk in which there is a much larger number of fat globules than in ordinary milk; so that there is practically no difference in its composition, except that the percentage of fat is very much higher. This increase in the number of fat globules can be obtained either by allowing ordinary milk to stand, so that the light fat globules rise to the upper part of the milk, which is then called "cream," the gravity method, or by centrifugalising so that the fat globules are driven into one portion of the milk. The latter method is that which is in common use now in most large towns; but in the country and the home-manufacture of cream the gravity method is still the common one.

In the use of cream for infant-feeding it makes a very considerable difference which of these methods has been used, for the percentage of fat is entirely different in the two methods. The cream made by centrifugalisation commonly contains about 48 per cent. of fat; that made by gravity will contain a greater or less amount chiefly according to the time it has been allowed to stand, and the proportion may be as low as 16 per cent. or even lower; or, on the other hand, it may be, as in Devonshire cream, about 60 per cent. or higher. It is hardly to be wondered at, therefore, that infants are sometimes sick when cream has been given without regard to the proportion of fat which it contains; for the proper use of cream it should contain a known percentage of fat. Unfortunately standardised cream can rarely be obtained, and if commercial cream is used it is safest to proceed on the assumption that it contains at least 48 per cent. of fat, unless indeed an accurate estimate can be obtained.

In such a cream we may consider that the proportion of proteids and sugar remain practically the same as in milk, only the fat percentage is altered from 3·5 per cent. to 48 per cent., and it is evident that by diluting with eleven parts of water we shall reduce the fat to 4 per cent., and then, adding milk-sugar, as in the modifications of milk described above, we shall obtain a mixture with a fair proportion of fat and sugar but an exceedingly small proportion of proteids. Such a mixture will often agree remarkably well with an infant who has difficulty in digesting the casein portion of the proteids.

Instead of using plain water to dilute the cream, barley-water is sometimes used, for the small amount of starch in it possibly has some nutritive value, although it must be used with the caution already mentioned. A much more satisfactory diluent is whey, which may be considered for this purpose as simply a watery solution of the soluble lactalbumen of milk, and so may supply the deficiency of proteid which is the fault in the cream and water mixture, without adding the troublesome curd-forming proteid casein.

When cream cannot be bought it is often possible to obtain as good results by using what is to all intents and purposes a home-made cream. A quart of milk is allowed to stand in a covered jug in a cool place for three hours, the lower one and a half pints are then syphoned off with as little disturbance of the upper part as possible, and the remaining half-pint, into which the fat has risen, is found to contain about 8 per cent. of fat, which can be diluted on the same principles as the richer bought cream. It is more convenient to use a graduated glass bottle with a tap near the bottom, by which the lower milk can be withdrawn.

Whey is milk from which the casein has been removed by curdling and then straining it off. For this purpose the curdling ferment of the stomach, rennet, is commonly used; an acid fluid, such as lemon-juice or sherry, is equally effective, and in certain cases is to be preferred. In the process of curdling much of the fat is entangled in the curd, so that the milk is deprived not only of its casein but also of much of its fat. To some extent this deficiency in whey can be remedied by breaking up the curd thoroughly with a fork before straining it off. In comparing whey with milk, therefore, we find that the easily digested lactalbumen (which is not precipitated by rennet or by acid) remains much the same as in ordinary milk, the fat is diminished, even when the curd has been broken up, to 1 per cent. or less, the sugar and salts remain practically unaltered. Such a weak albuminous fluid makes an extremely valuable food in many of the gastro-intestinal disorders of infancy, where the digestive powers, especially for casein, are much enfeebled, and when the deficiency of fat can be rectified by the addition of cream many an infant will thrive on this food alone for several weeks. Such a mixture as the following will be found suitable for many infants under six months of age :

Whey	eight tablespoonfuls.
Cream (48 per cent.) . .	two teaspoonfuls.
Milk-sugar . . .	one level teaspoonful.

Humanised Milk.—Any modification of cow's milk which has for its object the production of a milk resembling as nearly as possible human milk may be described as "humanising." Many of the commercial preparations sold as "humanised milk" are prepared in exactly the same way as is done in the home preparation of milk on the principles described above, with the only advantage that such milk is ready for use without any further modification and with the disadvantage that such milk is necessarily, for commercial purposes, completely sterilised by prolonged exposure to a high temperature—a proceeding which certainly interferes in some way with the nutritive value of the milk.

Many of the large dairies now supply such already modified or "humanised" milk, and excellent results are sometimes to be obtained from its use; as a further convenience some firms supply this milk in two or three different strengths, the difference being chiefly in the quantity of proteid present. In the

Gaertner process (Friern Manor Dairy Company) diluted milk is centrifugalised in an apparatus so arranged that known proportions of the whole quantity issue from two separate spouts; that issuing from the one spout contains nearly all the fat from the milk, together with an amount of proteid and sugar corresponding to the original dilution, and is used to prepare the "humanised milk" by simply adding milk-sugar and sterilising. In this way humanised milk of four different strengths is prepared: a "Special," containing approximately ·6 per cent. of proteid; No. I., containing 1 per cent. of proteid; No. II., 2 per cent. of proteid; and No. III., 3 per cent. proteid; the fat and sugar average 3·5 and 6–7 per cent. respectively. The Aylesbury Dairy Company prepare humanised milk of two strengths, analyses of which, by Mr. Richmond, showed the following average percentages: No. I., proteid, 1·35; fat, 4·18; sugar, 4·65. No. II., proteid, 2·11; fat, 3·68; sugar, 5·0 per cent.

Peptonised Milk is sometimes useful as a temporary food, but should never be used longer than is necessary, for the stomach may become lazy by indulgence and refuse to do its proper work for itself if such predigested food is used too long. With this caution, and remembering that peptonised milk is laxative, and may indeed start a diarrhœa, we may say that peptonisation is particularly valuable where there is much colic and flatulence and vomiting of undigested curd. The preparations most in use are Fairchild's Zymine and Benger's Liquor pancreaticus, either of which is supplied with full directions as to use. It must be remembered that for peptonisation it is usually directed to dilute the milk, and therefore the deficiency of fat and sugar requires correction as in the simple dilution of milk. An excellent preparation in which the sugar deficiency is already corrected is Fairchild's Peptogenic Powder; if cream is added to the diluted milk according to the directions, or rather if 48 per cent. cream is used in the proportion of two tablespoonfuls to one pint of the mixture of cold water and milk, the food thus prepared is generally taken well, even by infants with very feeble digestion.

Asses' Milk: Milk of other Animals.—By careful modification of cow's milk by one or other of the methods already mentioned it is almost always possible to adapt it to the needs of any particular infant. In rare cases, however, the milk of some other animal may be preferable, or perhaps may be more easily obtained. Almost the only other animals whose milk is occasionally used for infant-feeding are the ass and the goat; very rarely ewe's milk and mare's milk have also been used.

Asses' milk is sometimes useful when the curd of cow's milk cannot be digested, for it contains a very small proportion of casein, and the curd formed with an acid is almost as finely flocculent as that in human milk. It is, however, so poor in fat that it is only suitable as a temporary food; its laxative effect may also be undesirable in particular cases.

Goat's milk, unlike asses' milk, is rich both in casein and in fat, and therefore is only likely to be suitable for infants with good powers of digestion; the curd, however, is certainly sometimes more finely divided than that in cow's milk, and it is possible, therefore, that an infant may thrive on goat's milk when it is unable to digest cow's milk. Whether asses' milk or goat's milk is used, dilution will be necessary on the same principles as in the use of cow's milk, and the degree of dilution which is required can be judged from a comparison of the percentage composition of the several milks, as shown in the following table:

	Human Milk.		Cow's Milk.	
Proteid	2·0	Casein ·6 Lactalbumen 1·4	4·0	Casein 3·25 Lactalbumen ·75
Fat	3·5	...	3·5	
Sugar	7·0	...	4·0	
Salts	·2	...	·7	

	Asses' Milk.		Goat's Milk.	
Proteid	1·8	Casein 1·0 Lactalbumen ·8	3·7	Casein 3·0 Lactalbumen ·7
Fat	1·0	...	4·2	
Sugar	5·5	...	4·0	
Salts	·4	...	·5	

Koumiss may be mentioned here: it has been used for infant-feeding but is more suitable for children beyond the age of infancy, for whom in conditions of weak digestion, particularly during convalescence from acute illness, it is occasionally valuable. It is prepared in this country from cow's milk, in which fermentation is produced by the addition of cane-sugar and brewer's yeast (details will be found in the Appendix). When ready for use it has a markedly acid reaction, and contains a large number of micro-organisms. It contains also much gas which should be liberated and dispersed by gently shaking the koumiss before this is used for infants. The peculiar beery taste is sometimes disliked by children, but in spite of this it is often well taken. Koumiss contains a small quantity of alcohol (1–2 per cent.), and no doubt its value is partly dependent upon this. We have used koumiss as an addition to other food, but if it be used alone or as the chief article of diet it should be remembered that it is very deficient in fat: some prepared at the Children's Hospital, Great Ormond Street, showed 1 per cent. of fat, and in some supplied by a London Dairy Company we found only ·05 per cent. of fat.

Condensed Milk.—Amongst the poorer classes there is probably no food which is more often used for the feeding of infants than condensed milk, and we may add that there is probably no food which is more often responsible for rickets of every degree, not to mention various gastro-intestinal disorders and the occasional production of scurvy. Still, in spite of the injurious effects which are so often seen from the prolonged use of condensed milk, there are undoubtedly circumstances in which its temporary use may be of value.

Two kinds of condensed milk are in common use—sweetened and unsweetened. These might be further subdivided into the cheap brands made from skimmed milk, and totally unfit for infants' food under any circumstances whatever, and the better-class brands which are made from whole milk with or without added cream.

If condensed milk is to be used at all it must be used with an intelligent knowledge of its relation to fresh cow's milk; some of its disastrous results are due to the reckless manner in which it is used without any regard to the exact dilution which it requires.

One may say roughly that the condensation is usually sufficient to make the proportions of proteid, fat, and milk-sugar three times as great as in the fresh milk. With an unsweetened condensed milk, therefore, it is possible by simple dilution to obtain a mixture which very fairly represents *cow's milk*, but after it is diluted to this degree the casein is still the casein of cow's milk, and must be diluted still further to bring it within the capacity of the infant's digestion, and the sugar and fat are just as deficient after this further dilution as they would be in cow's milk similarly diluted, so that it becomes necessary to add cream and milk-sugar as to a mixture of fresh cow's milk and water.

Sweetened condensed milk, on the contrary, cannot be brought to the proportion of either cow's milk or human milk by any process of simple dilution. The added cane-sugar makes this impossible ; if dilution is sufficient to reduce the percentage of sugar to the proper degree (6–7 per cent.) then the percentage of fat is far too low, if the dilution is only sufficient to reduce the percentage of fat to the required 3–4 per cent., then the proportion of sugar remains far too high. The only possible way of adjusting the composition of sweetened condensed milk is to dilute it sufficiently to make the proportion of sugar suitable, and then to correct the deficiency of fat by adding cream.

The relation of condensed milk to human milk and cow's will perhaps be made clear by comparing together the average percentage composition of each of these foods :

	Human Milk.	Cow's Milk.	Condensed Milk (sweetened).
Proteid	2·0	4·0	10·9
Fat	3·5	3·5	9·5
Sugar	7·0	4·0	54·2 { Cane-sugar 41·1 Milk-sugar 13·1
Salts	·2	·7	2·03
Water	87·3	87·8	23·37

Unsweetened condensed milk may be taken as having roughly the same composition as the sweetened, except that the cane-sugar is absent ; and therefore the proportion of sugar will be 13·1 and that of the water 64·47 per cent.

The result of diluting these condensed milks so as to bring the proportion of each constituent as near as possible to that of human milk may be seen from the following comparison :

	Human Milk.	Condensed Milk (sweetened) Diluted seven times.	Condensed Milk (unsweetened) Diluted four times.
Proteid	2 per cent.	1·3 per cent.	2·1 per cent.
Fat	3·5 „	1·1 „	1·9 „
Sugar	7 „	6·7 „	2·6 „

How widely these simple dilutions of condensed milk differ from human milk is sufficiently obvious; but they are often given much more diluted than this, and it is little wonder if an infant slowly starves or gets rickets on these mixtures, in which the fat is diluted almost out of existence.

If sweetened condensed milk is used it should be diluted seven times, and cream added (centrifugalised, 48 per cent.) in the proportion of 1 teaspoonful to every three ounces; if unsweetened be used, it should be diluted with at least four times its quantity of water, and cream should then be added as to the sweetened milk; but here it will be necessary to add milk-sugar also in the proportion of nearly one teaspoonful to every three ounces of the mixture. A modification of the ordinary condensed milk can be obtained in the form of condensed peptonised milk (Savory and Moore): this resembles the better-class brands of ordinary sweetened condensed milk in containing a comparatively high percentage of fat (12·5 per cent. in a specimen which we examined), but, owing to previous peptonisation, no curd is formed on the addition of an acid, a point which may make it of value—with proper dilution and the addition of cream—as a temporary food for a very limited period, where there is difficulty in digesting the curd of ordinary condensed milk.

But even when its dilution has been adjusted with the utmost care, condensed milk is still not the same thing as fresh milk, some virtue has gone out of it in the process of condensation, it has lost its antiscorbutic properties, and an infant fed for several weeks on condensed milk may at any time show symptoms of scurvy.

Having pointed out the disadvantages of condensed milk, it is only fair to say a word on its occasional usefulness. There are infants who seem to digest the curd of condensed milk with less difficulty than that of fresh cow's milk, and for this reason they may flourish for a time on well-diluted condensed milk, but the deficiency of fat is to be remembered, and if this cannot be remedied by the addition of cream, rickets will almost certainly result from any prolonged feeding of this kind; then again there are times when, owing to hot weather or the presence of epidemics, fresh cow's milk is treacherous, and there is less risk of tainted milk in the condensed form; and lastly, in travelling, condensed milk may be the best available substitute.

Proprietary Foods.—Any account of infant-feeding nowadays would be incomplete without some reference to the innumerable patent foods which boast themselves as substitutes for, if not improvements on, Nature's method of infant-feeding. Some of these undoubtedly have their value in certain cases, but it is equally certain that many an infant leads a life of misery, and wastes, and too often dies, from the indiscriminate use of one or other of them. To give an infant of three months old a food containing a considerable proportion of starch—and this is the case with a large number of so-called infant-foods—is a sure way of producing gastro-intestinal disorder of one kind or another, with its attendant distress and wasting; and a watery mixture made up of some patent food which consists chiefly of sugars, dextrose, maltose, and so on, with little or no fat, may produce the fat baby of advertisements, but is only too likely also to produce a fine specimen of rickets. In spite of all advertisements to the contrary, there is not a single patent food in the market which can adequately replace either human milk or cow's milk for prolonged use in the feeding of infants, but there are several which are useful under certain conditions, either as temporary substitutes for cow's milk or as additions to it, and if these are to be used with advantage it is essential that they should be used with careful discrimination, and that it should be recognised that a patent food which is suitable at one age may be utterly unsuitable for an infant a few months younger.

These foods may be divided into five groups:

(1) Those consisting of dried milk with the addition of entirely malted cereals. Well-known examples of these are Horlick's Malted Milk and the Allenbury Food No. 1 and No. 2. In these the starch has been completely converted into soluble carbohydrates, so that no starch is present.

(2) Those consisting of dried milk with the addition of partially malted cereals, and therefore containing starch. Nestlé's Food may serve as an example of these.

(3) Entirely malted cereals. Mellin's Food is the best-known example of these; it contains no starch, and consists almost entirely of soluble carbohydrates, with a very small proportion of proteid.

(4) Partially malted cereals. Such as the Allenbury Food

No. 3. Savory and Moore's Food and Benger's Food are very little different; the former contains malt diastase and the latter pancreatic ferment, by which the conversion of starch is further carried on when the food is mixed with a warm fluid. All of these foods, as given to the infant, contain a considerable quantity of starch.

(5) Cereal foods, in which there has been little or no conversion of starch. Such are Ridge's Food, Neave's Food, Frame Food, Robbs' Biscuits, ordinary corn-flour, or entire wheat-flour, and the preparations from bread and baked flour which are described in the Appendix. All these must be reckoned amongst the foods which are only suitable at an age when starch can be easily digested. The following table,* including analyses made by Dr. Leeds and others, shows the exact composition of some of the foods in common use:

—	Allenbury No. 1.	Allenbury No. 2.	Horlick's Malted Milk.	Mellin.	Nestlé's Food.	Savory & Moore.	Allenbury No. 3.	Ridge's.
Starch . .	0·0	0·0	0·0	0·0	36·86	36·36	60·01	77·96
Soluble carbohydrates (sugar dextrine, etc.)	65·48	69·02	63·59	68·18	40·9	44·83	25·1	5·19
Fat . . .	13·15	12·48	8·4	0·18	4·25	0·43	1·05	0·63
Nitrogenous bodies	14·25	12·5	21·85	10·07	11·0	9·63	10·23	9·24
Ash . . .	4·75	4·08	3·95	3·75	1·7	0·89	0·6	0·6

The principles which have been already laid down as to the proportions of each food constituent required by an infant apply equally well to the patent foods; and it is on these principles that we must decide whether any food is suitable in a particular case. It may be said generally that no food which contains starch should be used for an infant under seven months of age, and in most cases this age might be extended to nine months with advantage. Only those foods, therefore, in which the starch has been completely converted into soluble carbohydrates, by malting or otherwise, are fit for an infant at this age.

But the question of starch or no starch is not the only one to then removed, and if it has been closed with cotton-wool while in the apparatus, the cotton-wool stopper is removed when the milk is cool, and replaced by a teat, if the same bottle is to be used as a feeder, or by some closely fitting stopper. In some forms of the apparatus special rubber caps are supplied, which allow for the escape of steam during heating by a small aperture which closes tightly as the milk cools. Such apparatus may, of course, be used for sterilisation by keeping the water at the boiling-point for about three-quarters of an hour or more.

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* These figures, as also several of the analyses given in this and the previous chapter, are quoted from the article on "Infant-feeding," by Dr. Still, in the "Encyclopædia Medica."

Simply raising the milk just to the boiling-point, and then at once stopping the process, is the speediest method of rendering the micro-organisms innocuous, and as this method is available under almost any circumstances, it is perhaps the most generally useful; it is certainly much to be preferred to prolonged boiling, or sterilising by higher temperatures, which seem to interfere in some way with the nutritive properties of the milk and to deprive it of its antiscorbutic power. Whether the milk is boiled or pasteurised, it should be cooled rapidly afterwards, either by standing in cold water or on ice; otherwise as it passes slowly through the lower degrees of warmth it affords an excellent culture medium for any spores or bacteria which may remain or may have been subsequently introduced by accident.

In all preparation of food for infants it is necessary to insist on the most scrupulous cleanliness. No one would believe without actual experience how difficult it is to keep a feeding-bottle and its tube sweet. Indeed, so difficult is it, even with the greatest care and the closest supervision, that it is advisable to simplify the apparatus as much as possible. For this reason it is best to discard all tubing: it is practically impossible to keep any india-rubber tube free from stale milk and bacteria, and it is extremely probable that diarrhœa is kept up in some cases by the use of such tubing to a feeding-bottle. The slipper-shaped bottle, with a teat fixed directly on to the mouth of the bottle, is much the best form—even a screw top is to be avoided as troublesome to clean, and therefore as introducing a possible nidus for bacteria. Conical teats are now made which fit on to the mouth of the bottle, and can be easily removed and turned inside out for cleansing purposes; the only disadvantage of these teats is that in the lack of a shield a vigorous infant sometimes sucks nearly the whole teat into its mouth and almost chokes itself thereby. The teat must have a free enough opening, whether a round pinprick, or of leech-bite shape, to allow the infant to draw the milk without great effort; but too large a hole is bad, for many a hungry infant will gulp down its meal in haste if it can, and pay the penalty afterwards in vomiting or colic.

One advantage of the boat-shaped or slipper-shaped bottle is the necessity which it lays upon the nurse of actively superintending the taking of the meal; there is no long flexible tube with a teat at the end of it to leave in the baby's mouth as it lies in its cot and looks after itself whilst the nurse looks after other things; these bottles must of necessity be held by the nurse during the whole meal, and rightly too, for no child should be left to take its meals as it wills. Some infants are inveterate bolters, and will consume a bottle of milk in five minutes which should take them at least ten. The rate of supply should always be controlled by the nurse.

An infant's food should be given at a temperature of about 100° F. This can be obtained by the same apparatus which is used for pasteurising, the temperature of the water being regulated by the thermometer.

After the meal is over the teat should be removed, and any food remaining in the bottle should be thrown away; the two parts should then be well washed in hot water, and kept in a weak solution of salicylate of soda (gr. iv. to ℥j of water); or in water to which a good pinch of borax has been added.

Diet of a Healthy Infant.—Up to the age of nine months a healthy infant will usually thrive on fresh cow's milk alone modified by dilution with the addition of sugar and cream as described above. The infant must be fed at regular intervals, and, indeed, if regularity is the rule from the beginning there will be little trouble in this respect, for children, like their elders, are creatures of habit. In our opinion, a healthy infant should not be allowed to sleep on beyond its proper feeding time; it will quickly drop off to sleep again, and there will be far less trouble from waking it up for its proper feeds than from the screaming and wakefulness which so often result from irregular intervals in feeding.

Even from the beginning the infant should be accustomed to miss one meal at night; when it is about a month old it may

After eighteen months, or when the double teeth begin to appear, it may commence meat, and the meal-times may be somewhat altered. At 8 A.M. breakfast, a breakfast-cupful of bread and milk, or milk with thin bread and butter, or the yolk of an egg lightly boiled. Thin porridge may be substituted on some days.

A drink of milk-and-water with a rusk may be given, if necessary, during the morning. At half-past one, dinner, a tablespoonful of pounded mutton, with some mashed potato and gravy, or a cup of beef-tea in which some vegetable has been stewed, and laittle toast-and-water to drink. At 5, a breakfast-cupful of milk, thin bread and butter, and stale sponge-cake. No other meal will be necessary, but a little milk may be at hand in case of need.

After two years, meat may be given daily, and fine mincing must be substituted for pounding. Light farinaceous pudding may also constitute part of the daily midday meal, the other meals remaining as before.

Thirsty children may have water or toast-and-water occasionally between meals; and all milk and water should be sterilised before consumption.

I have often been asked, in the case of older children, to draw out a diet table, but it is quite unnecessary. All children should have plenty of milk, and bread and butter for breakfast and tea; and roast or boiled meat with gravy and light vegetables for dinner, with some light farinaceous or suet pudding or stewed fruit. With regard to quantity, the only rule I would enforce is this—let some reliable person be always present at meal-times to see that the food is taken leisurely and properly masticated, and if this is done I believe that very few children will take too much. Some children require more than others, but, if the meals are not hurried, the healthy appetite is satisfied at the proper time, and is a far better indicator than any arbitrary rule can ever be. Food-bolters are the children that get into trouble from over-feeding. They steal a march upon their stomachs, and before they feel satisfied they have taken too much. For such, the old adage to leave off with an appetite is needful, but it is not the teaching of physiology. In the same way with children's likes and dislikes; if the rule given above be observed, what a healthy child likes it will usually digest, what it dislikes will disagree. I am, of course, assuming that its experience lies well within the range of wholesome articles of diet. Take the case of fats and sugar, for instance. Nearly all children dislike fat, and are equally fond of sugar. It is an unquestionable fact that rich articles of food easily upset them; what, therefore, can be the sense of insisting on children eating fat? The liking for it comes at the proper time. On the other hand children are fond of sugar, and make up with it where they fail in fat, and there is no evidence whatever that sugar is harmful when taken at proper times. To take sweets at all hours of the day at the expense of the proper meals is one thing, and to be strictly forbidden; the moderate consumption of saccharine material at meal-times, whether it be in the form of sugar or good wholesome preserve, is quite another thing, and as certainly to be recommended. It is often stated that sugar is bad for the teeth. But there is no evidence of this; and the physiological probability would surely be that sugar is only harmful in proportion as it leads to indigestion, and to consequent disorder of the salivary and buccal secretions. In other words, it is the abuse, not the use, of saccharine matter which is to be deprecated.

No doubt there are some children the functions of whose stomachs seem to be topsy-turvy. Everything they ought to like disagrees with them, and they live—I will not say thrive—upon most unwholesome diet. Some will be almost entirely carnivorous, some cannot take milk, others resent farinaceous puddings, and so on. But it will generally be found that, where this is so, the early education of the stomach has been at fault, and patient correction will bring it round. Mothers and nurses will say a child cannot take this and that, because they have administered the thing improperly. But if the medical man insists on a return to such diet under strictly detailed conditions—nay, sometimes it may be necessary to make it one's business to see a child at its meals and what it is eating—no difficulty whatever will be experienced in its digestion. Moreover, it needs to be remembered that dislike to certain foods is in many children a simple matter of inexperience. A good deal of patience is often required to teach a young child to like green vegetable, for instance. Little by little, but persistently, day by day, it needs to be taught; and so with many articles of food to which it has hitherto been a stranger.

the lungs were dull; tubular breathing and bronchophony extended up to the spine of the scapula on the one side, and on the other were audible in patches, with much bronchitic crepitation in the larger tubes.

Treatment.—A careful attention to the rules laid down for dieting healthy infants will in most cases prove successful. Inasmuch as the child has usually been improperly fed, it is generally advisable to give a few doses of some mild aperient, and none is better than castor-oil, which, sweetened with sugar, most infants take readily: a dose of one drachm may be given to an infant twelve months old, and half a drachm to an infant of six months. One or two grains of mercury and chalk, with a grain of rhubarb, and two or three grains of bicarbonate of soda given at night, or twice a day for a day or two, make another good laxative and alterative for such cases.

Insufficient food must, of course, be met by increasing its quantity, but caution is necessary in doing this. The stomach of an infant that has been persistently starved for some weeks, or even months, will not tolerate an immediate return to the quantity of food which would be suitable for a child of its age under natural conditions. The increase must be made by stages; if not, the stomach, which in early life is most punctilious in resenting any sudden departure from its recognised custom will certainly relieve itself by vomiting. An infant who has been taking perhaps half a pint of milk in the twenty-four hours with bread, and so forth, may have half a pint of milk substituted for the bread, and the pint is to be day by day slowly increased till the proper quantity (two pints) is reached. Nor is it uncommon for such children to require an amount of dilution of the milk out of proportion to their age. Educated upon faulty principles as it has been, the stomach adheres to them with pertinacity, or becomes so irritable that even proper feeding does not seem to suit, and the child can only be saved by the most patient and attentive, even quick-witted, regulation of its diet. Use what care we may, whenever a child has continuously wasted for some weeks, the prognosis must be doubtful until it has begun to increase in weight under the treatment adopted.

Such cases, indeed, but for the objections, often insuperable, which have already been alluded to, should always be wet-nursed. When this is not possible the milk must be carefully modified according to the principles laid down in the previous chapter; or one or other of the so-called "humanised" milks sold in the shops may be used. Sometimes a mixture of ordinary centrifugal cream (48 per cent. fat), two teaspoonfuls with eight tablespoonfuls of water and a large teaspoonful of milk-sugar will make a suitable food, or the mixture of whey and cream (p. 52) may be tried. Raw meat-juice diluted and mixed with cream is sometimes valuable; a teaspoonful of raw meat-juice made according to the directions given in the Appendix should be diluted with five tablespoonfuls of water; to this a teaspoonful and a half of cream (48 per cent. fat) and a teaspoonful of milk-sugar should be added. Cheadle's formula of bread-jelly (*see* Appendix) has sometimes proved effectual; a dessert-spoonful may be mixed with four ounces of peptonised milk, or with the same quantity of a mixture of cream (two tea-spoonfuls) and water (eight tablespoonfuls). Peptonised milk alone will suit some cases better, but it may require further dilution in addition to that which is used in the process of peptonising, and it should be remembered that the proportions of fat and sugar are lowered by the dilution to exactly the same extent as in diluting ordinary boiled or unboiled milk, so that the addition of cream and sugar in proper proportions is desirable.

Any one of these various methods of feeding may in one case or another enable the child to turn the corner, and when this is effected a simpler diet can be gradually resumed.

Flatulence and **Colic** are amongst the most frequent digestive disorders of infancy. They are so commonly associated that it is unnecessary to discuss their separate symptoms. Flatulent colic is recognised in most cases by its relation to meals. Soon after food a child becomes restless, kicks its legs about, begins to grunt, and then perhaps utters a piercing, or sometimes a prolonged and harsh, cry. At the same time the stomach is rigid, the face turns pale, and after a time eructations take place, and perhaps some vomiting of curd. As digestion proceeds the pain ceases. The physics of flatulence are not easy of elucidation, but the condition is associated either with poorness or deficiency in quantity of milk on the part of the mother —when it is reasonable to suppose that it is due to emptiness of the stomach—or with indigestible food. It is frequent where cow's milk is given, and in that case is due to the formation of teacupful of cold water, and let it stand for two or three hours, then stand in a saucepan of water and boil till the gelatine is dissolved. A teaspoonful of the jelly thus formed to the half bottle of milk.

When the pain is very severe the colic may be relieved by warming the feet; by a warm linseed-meal poultice to the abdomen; by ten or fifteen drops of brandy in a little warm milk and water; sometimes by a few drops of aqua chloroformi. Where there is any suspicion of the retention of irritating material in the intestine some castor-oil must be given. This may usually be prescribed after the formula given (F. 4), but if it also be accompanied by griping, it may be associated with a minute dose of opium, three drops of the tincture in a three-ounce mixture, a drachm to be given twice or three times a day (F. 5) to a child of nine months to a year old. Often speedy relief may be given by injection of warm water into the bowel, and it may be wise to add soap or olive oil to the injection to secure evacuation of irritating fæces; the infant should be kept warmly covered whilst the enema is administered; all unnecessary exposure is to be carefully avoided. In all cases of flatulent colic it is essential to see that the child is kept warm. It is not only necessary to encase the legs and abdomen in flannel, but to see that the wraps are retained in position. It often happens that a flannel binder is put upon the abdomen and sewn on, as it is thought, securely, but it quickly slips up, and the abdomen is left quite uncovered, as may easily be proved by putting the hand under the clothes of half a dozen babies consecutively. Again the feet are wrapped quite properly in worsted socks, and are then allowed to get wet with urine; so that, whilst having the semblance of being adequately cared for, appearances are belied by facts. Further, while the clothing of infants is adapted for the most part to the exigencies of urination, &c., it is so constantly wet, that anything elaborate for the loins and legs is less convenient than the time-honoured napkin. Hence it comes that, while the thorax is well clothed in four or five layers of raiment, the abdomen and legs are practically naked—save for such melancholy protection as is afforded them by some overhanging petticoat. But the lower part of the body requires as much care as the upper. It is at least as sensitive to chills and as liable as other parts to receive and promulgate harmful impressions. Therefore, when long clothes are discarded they should be replaced by a pair of loose flannel drawers, such as can be fixed to the wraps covering the chest, and will go outside the necessary napkins, being tied loosely either over or under the socks at the ankles. Knitted jerseys and drawers for infants are now very generally sold, and are admirably adapted to their purpose.

Constipation may be due to malformation about the anus, more frequently to fissure, but most frequently, of course, of all to something amiss either in the tonicity of the bowels, the material it contains, or both. It is with the last group of cases that we are here concerned. The fæces are almost always paler than normal, or even grey, like those of jaundice. Constipation may prove troublesome even from birth, and I have notes of several cases where the bowels acted only every seven or eight days for some weeks. Some recommend that when this is the case the suckling should be treated through the mother, but this is a plan which is neither pleasant for her nor very successful in overcoming the constipation. If it be desirable to treat the case so, a seidlitz powder may be given or some Carlsbad salts, or two drachms of bitartrate of potash may be dissolved in barley water, flavoured and sweetened, and taken as a drink during the day. For the infant, castor-oil (F. 4) is good as an occasional aperient; but is less suitable for chronic constipation, as its after-effect is to make the bowels more costive. Sometimes a little fluid magnesia twice or three times a day answers the purpose, or five grains of the sulphate of magnesia dissolved in syrup of ginger and dill-water (F. 6). Manna may be given (F. 7), or a powder of two grains of rhubarb and three of soda every night. Jacobi recommends that a piece of loaf-sugar (a teaspoonful or less) be dissolved in tepid water or oatmeal-water and given before each nursing; this will often prove the only remedy required to regulate the bowels.

When a few months have passed over, or if the child be brought up by hand, better than all medicines by the mouth is the plan of attempting to modify the diet, or of exciting the lower bowel to expel its contents by enema, or suppository of soap. A teaspoonful of fine oatmeal may be added to the morning meal, or barley-water may be mixed with each meal, or the addition of cream may be tried. Friction should also be enforced. It is at least as necessary that a child should go to the closet regularly, as that in the case of the boy his educational routine should be attended to, or of the girl, that she should do certain household duties or perfect herself in certain accomplishments with regularity. But this is a matter that many mothers never think of. In the next place, cases of this kind are not adapted for the frequent exhibition of purgatives. Some gentle alkaline laxative may be given for a day or two and, if it were not so nauseous to most palates, none is better than the old-fashioned rhubarb and soda (F. 12). Hospital out-patients take this, and even like it, but other children very seldom do, and a dessert-spoonful to a tablespoonful of the liq. magnesiæ carbonatis is taken by them with less repugnance. Cheadle's formula of twenty to forty grains each of the sulphate of soda and sulphate of magnesia is efficient. It should be combined with nux vomica, or that and belladonna, and be continued twice daily after food until the bowels act regularly. Some take Friedrichshall or Apenta water very well; others, the granular effervescing salts. Condal water is said to be taken well by children and is useful. The sulphate of magnesia may be rendered fairly palatable with raspberry vinegar (F. 13). Sir Alfred Garrod's compound sulphur lozenge (now in the British Pharmacopœia) is also very useful in some of these cases, as is also the confection of sulphur, half a teaspoonful or one teaspoonful being given every night for a few days at a time. There is no objection to the administration of a single purgative of more drastic nature if it be only to ensure that the intestinal canal is cleared of all irritating contents. A grain of calomel, with six or eight grains of compound jalap or scammony powder, is efficient for such a purpose for a child of seven to ten years old; or a quarter to half a Tamar Indien lozenge may be given instead, the remedy being more pleasantly administered in the lozenge form. The compressed tablets now made are also very suitable for children. Aloin and cascara sagrada may be given in this manner, and the latter may also be given in the form of a palatable jelly. But drugs of this kind are to be given with this one distinct object in view, and they must not be resorted to repeatedly. When all such preliminary difficulties are cleared away, the constipation is to be cured by plenty of exercise in the open air; by a diet of plain nutritious food, with green vegetables and fruit; by insisting upon the proper mastication of all food, and by drugs which act as hepatic stimulants and tonics; strychnine may be given as a tonic to the bowel and arsenic and iron as blood restorers. Euonymin and podophyllin in small doses are useful members of the former class. (F. 14, 15, 16, 18, 19.)

Constipation, when it is unassociated with other symptoms, does not do much harm, and it may be remedied by patience and a little management.

Constipation, when it is associated with sickness, always requires careful investigation, and the possibility of intussusception, or of peritonitis, or of brain disease, should be considered.

Constipation, when it is obstinate from birth, demands an examination of the rectum. Narrowing of the canal from the presence of some partial septum or other congenital malformation, though rare, is for that reason apt to be overlooked when the condition is not extreme. And other forms of malformation, such as internal stricture of some portion of the small intestine, and even hernia, occasionally exist, although but rarely.

Constipation in young children is by no means uncommonly associated with small fissures about the anus. The pain of defæcation is so severe in these cases that the sphincter contracts tightly and prevents any successful expulsive effort.

If there be an anal fissure, the bowels must be kept slightly relaxed, to obviate any stretching of the part, and the fissure should be treated locally by keeping the lower inch of the bowel and anus well greased with an ointment composed of equal parts of lead, zinc, and mercurial ointment, or it may be dusted with equal parts of calomel and oxide of zinc. Occasionally it may be necessary to paint it with nitrate of silver, and once or twice I have been compelled to stretch the anus forcibly with the fingers, on the same principle as the surgeon adopts when in the adult he divides the superficial sphincter with the knife.

Chronic Dilatation of the Colon.—From time to time children are seen, almost invariably boys, with enormous distension of the abdomen, which at first sight might suggest tuberculous peritonitis or ascites. The history in some cases dates from birth, the bowels having always acted with difficulty, perhaps never without drugs or enemata; in others the bowels have worked naturally for the first few weeks or months of life, and since then have been costive. The abdomen is usually said to have been normal in size at birth and to have gradually become distended to its present dimensions. The mother herself in some cases has noticed the peristalsis of the colon. The appetite is sometimes very large, but the child does not flourish in proportion.

The following case may serve as an instance of this condition :

Ernest T., aged eight years, a thin delicate-looking boy, has always suffered with constipation. The bowels were not opened till seven days after birth, and then only by enema. The abdomen began to enlarge a few days after birth, and the enlargement, though varying in size, has persisted. Sometimes the bowels are not open for five weeks, and during these periods of constipation he often vomits. The abdomen was enormously enlarged ; the enlargement was uniform except when the dilated colon stood out in relief during peristalsis. There was no obstruction at the anus or in the rectum ; the latter appeared to be dilated. The heart was displaced upwards, so that its upper margin was behind the left clavicle and its apex beat in the second space. The breath was offensive. A brother died at the Hospital for Sick Children, Great Ormond Street, with the same condition, the autopsy showing a greatly hypertrophied and dilated colon with no apparent obstruction.

The course of these cases is very unsatisfactory. One case recorded by Osler was treated surgically : an artificial anus was made and he recovered. The majority die within the first twelve years of life, a few survive to early manhood. Careful treatment generally causes temporary improvement, but eventually, perhaps after a longer bout of constipation than usual, the bowel seems to become exhausted, and to lose all power of effectual contraction. The distension rapidly increases, gas and fluid fæces collect in the colon, and partly poisoned by the foul contents of the intestine, partly hampered in respiration by the extreme distension, the child dies.

The **ætiology** of the condition is obscure. It is uncertain even whether the dilatation of the colon is the result or the cause of the constipation. Various theories have been propounded to account for it, but one thing only is certain, namely, that there is no demonstrable obstruction. Congenital narrowing of the rectum or of the anus may and does in very rare cases produce similar symptoms, but these cases form a separate group. The morbid anatomy consists of enormous dilatation usually of the whole of the large intestine, the muscular wall of which is also hypertrophied. In some cases there is recent ulceration of the mucous membrane of the colon, evidently the result of the final distension.

Diagnosis is easy if one is aware of the existence of this condition. The enormous distension of the abdomen, the visible peristalsis, and the history of habitual constipation, make a clinical grouping which is not easily overlooked. The absence of signs of fluid will distinguish it from ascites, and the absence on palpation of evidence of matting or bands, together with the history, will generally suffice for the distinction from tuberculous peritonitis, with which it is most often confused.

Treatment must be directed to the avoidance of prolonged constipation, and the importance of this must be impressed on the parents. Regularity of habits and attention to diet are essential as in other forms of constipation. The evacuation of the bowels may be obtained in some cases by drugs. A combination of belladonna with nux vomica and aloes is perhaps as useful as any, and sometimes this, given two or three times a day, with a morning dose of some saline aperient, may be sufficient. Small doses of calomel seem to do good in some cases. Careful massage of the abdomen should also be tried. If drugs and massage fail, an enema must be given every alternate evening ; but large enemata are to be avoided, as it seems quite possible that they may aggravate the dilatation. In neglected cases we have more than once known it necessary to clear the rectum with the finger. When the distension becomes great the passage of a rectal tube by getting rid of flatus will sometimes give relief. In the light of cases recorded by Treves and Osler the question of surgical treatment may also have to be considered.

Prolapsus ani is a common result of constipation. It is seldom very troublesome. When it occurs, attention should at once be given to the diet and to the character of the stools. Generally speaking, it is a case for saline laxatives such as Condal water, the sulphates of soda and magnesia, &c., to keep the bowels well open and obviate all straining. The child should not be allowed to sit long at stool ; and if the bowel still comes down, the buttocks should be well supported during defæcation by the hands of the nurse, or a similar result may be obtained by strapping the two buttocks together by a broad strip of plaister in front and behind the anal aperture. It may even sometimes be necessary to induce the evacuation with the child in a recumbent position. The various surgical measures that have been recommended are seldom if ever necessary. The importance of replacing the prolapsed bowel at once must, however, be impressed on the mother: two fatal cases have recently come under notice where the prolapse had been neglected several days. Prolapsus ani is also an occasional result of diarrhœa, but it will then generally disappear without much trouble. It may be advisable in these cases to order an enema of sulphate of iron and cold water (a drachm to the half-pint), a third part of this to be used at a time every morning, or morning and evening, for a few days. The presence of threadworms in the rectum seems to cause it in some cases. It may also occur with any local disease of the bladder, or the straining due to abnormal conditions of the urine, and it is also sometimes associated with the straining necessitated by a tight phimosis. The possibility of a rectal polypus must also be considered.

CHAPTER VI.

DIARRHŒA—DYSENTERY—UNNATURAL STOOLS.

SOME writers have described many forms of diarrhœa, and would thus make the subject a complicated one for the student; but there is no corresponding morbid anatomy for the different kinds of looseness of bowels, and the results of treatment suggest a very simple division. Diarrhœa is the symptom of disordered or excessive function on the part of the neuro-muscular apparatus of the intestines, and any organ which depends for its action upon organic muscular fibre is liable to such functional derangements as may by their continuance become a confirmed habit, and yet have no appreciable morbid anatomy. The uterus may persistently abort time after time from the irritation of a syphilitic fœtus, for example, and show in itself no reason for so doing. The stomach may repeatedly cast its contents in a similar fashion; and in children, and less frequently in adults also, diarrhœa may continue for months, resisting all treatment, without adequate cause in any structural lesion. The student must not therefore conclude, as he is often inclined to do, that the diarrhœa being chronic and intractable, it is due to ulceration of the bowel; much less that not only is there ulceration, but that that ulceration is tubercular.

The division I propose to make as simple, and, according with practice, is into acute and chronic diarrhœa, and *in limine* this generalisation may be made:

Looseness of bowels which has existed any length of time should be closely investigated, as it is pretty sure to prove troublesome to stop, and may indicate serious disease of the intestine and mesenteric glands; while the diarrhœa which comes on suddenly, is associated with vomiting and prevails to such an extent in the hot season of the year that it has received the name of "summer diarrhœa," though by no means wanting in its more special dangers, need give rise to no such anxieties, being usually readily curable by simple means.

Acute Diarrhœa.—Of late years acute diarrhœa has been thought to be an index of the sanitary condition of large towns, and to be due in larger measure to filth and putrefactive processes, than, as had been previously held, to simple atmospheric disturbances, the nervous activities of dentition, and so on; and this view is probably correct. The very existence of large towns implies the presence of more or less material which possesses the power of originating putrefaction of all sorts. Aggregation is necessarily more favourable to the transmission of septic material than isolation can be. The subjects of this complaint are almost all under five and most of them under two years of age—that is to say, they are in great measure milk-feeders, and milk is a fluid which is very sensitive to contamination.[*] Dr. Niven, investigating the summer diarrhœa of infants in Manchester, found that the mortality was far heavier in hand-fed than in breast-fed infants.[†] It may therefore be very readily supposed that whatever tends to lessen the risk of putrefaction—and what more so than paying attention to the sanitary condition of a town?—will, by lessening the risk of decomposition to which milk and other foods are liable, by so much lessen the amount of summer diarrhœa.

It has been thought that some of the acute cases of diarrhœa in children may be due to a specific micro-organism. Dr. Klein has described a bacillus (the bacillus enteritidis sporogenes) which he has found in the intestine in many cases of fatal diarrhœa in infants, and recently it has been affirmed that in many cases of acute diarrhœa in infants, especially when mucus or blood with mucus is present in the stools, the bacillus of dysentery, Shiga's Bacillus, can be isolated from the evacuations. Several other micro-organisms have been shown to be associated more or less closely with infantile diarrhœa, but at present there is no evidence on which any specific rôle can be attributed to any one of these bacteria: it seems clear that there are many different micro-organisms all capable of exciting acute diarrhœa in infants, but we cannot at present say either on clinical or on pathological grounds that this or that variety of infantile diarrhœa is due to any particular micro-organism.

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[*] I may remind the reader that all organic liquids, though under ordinary circumstances liable to decomposition, remain absolutely unchanged as long as they are protected from particulate contagion, and there is good evidence that all fermentation and putrefaction are due to the introduction and growth of one or other of the various kinds of bacteria. Of milk in particular I may quote from Lord Lister, whose researches in this domain are well known ("On Lactic Fermentation," *Trans. Path. Soc. of London*, vol. xxix. p. 435): "I once met with a bacterium, but only once, that would not live in milk; for extremely numerous as the varieties of bacteria appear to be, almost all of them seem to thrive in that liquid." The outbreaks of such diseases as typhoid fever, scarlatina, diphtheria, and even of epidemic diarrhœa, which have of late years been traced to a milk source, must, according to present knowledge, be explained in this way, although the actual bacterium or germ has not as yet in all of these been proved to be beyond question. Dr. Niven has added to his researches also, and reports that of 219 specimens of milk taken haphazard from various sources twelve were found to contain the tubercle bacillus.

[†] *Lancet*, 1896, vol. i. p. 535.

Other factors also enter into the problem. There are some children, and some adults too, who are readily affected by alterations of barometric pressure, electrical atmospheric disturbances, and so on. Looseness of bowels is noticed in such subjects on any sudden fall or rise of the mercurial column; in sudden changes from one extreme to the other of heat or cold; or in thundery weather.

What such reactions may indicate etiologically—how far, that is to say, they point to changes in the food, and how far to some immediate action upon the system—it is impossible to say, and happily for the purposes of therapeutics, though the facts are worthy of recognition, they cannot at present be said to influence treatment.

Diarrhœa is supposed, and probably correctly so, to own many other causes more or less direct, such as chills, over-feeding, improper feeding, dentition, pyrexia of all sorts, rickets, syphilis; and some of these are associated with certain signs, which, as I have said, have justified to some writers the description of many varieties. I think it, however, sufficient to say that sometimes there is more or less fever, sometimes perhaps vomiting; in others there are lumpy motions of undigested food; a want of bile; an excess of bile; a rice-watery discharge. In other cases the evacuations are of peculiar colour, pink or green. Some are peculiarly offensive.

In one form or another during the summer months the out-patient room of any children's hospital is overrun with cases of diarrhœa, mostly infants of four or five months old and upwards. They group themselves into three varieties, which, for want of better names, I will call: (1) Simple diarrhœa; (2) Febrile diarrhœa; (3) Cholera infantum. Exception may perhaps be taken to such a nomenclature as this, because any one of the three varieties may be associated with fever, and the simple may run on to the febrile form, or even into cholera infantum; and this is still more the case if one should attempt to base a differentiation upon the character of the stools. No such basis is tenable. The history of a case of cholera infantum is that, after the passage of perhaps several semi-liquid brightly coloured stools, the bile suddenly disappears, and the evacuation becomes rice-watery. But take any milder case, and one can hardly lay down any definite exception to this—in some the bile-coloured semi-liquid material changes stool by stool into a brownish offensive fluid, and then becomes colourless; in others it becomes watery, with a green sediment; in some the stool is colourless and almost odourless from the first. And as regards the duration of the abnormal character of the stools, there is the utmost variety. In some, perhaps, there will be one or two watery colourless stools, and then bile will reappear; in some the natural colour comes back fitfully; in some the muddy water or green stool continues for days; in most the full flux of bile is long in reappearing. No matter what the disease or the classification may be, if the latter is based upon symptoms, and not upon distinct pathological conditions, it is likely to be technically faulty, although it may be none the less useful to work from. So here; simple diarrhœa is not symptomatically febrile, although the body heat may sometimes be increased. Febrile diarrhœa, on the other hand, is associated with the aspect, the tongue, the pulse of fever: and cholera infantum, while it will often show a higher pyrexia than either of the other varieties, has nevertheless a characteristic garb of its own.

Simple Diarrhœa, the Catarrhal Enteritis of some authors, varies much in severity. To take a common case: the child has been vomiting and purged for some days with little apparent disturbance of its health. There is a certain amount of pallor, a little fretfulness and restlessness, and slight rise of temperaure.

It is usually thirsty, will drink any quantity of cold water, and milk is vomited undigested in curds. The mouth is somewhat dry, the tongue redder than natural, and its papillæ are prominent. There may be some erythema about the buttocks, and the motions are usually liquid, green, and offensive. Sometimes the evacuations are bright yellow; in others again pale. The majority of such cases are readily cured by simple treatment, but it also happens sometimes that, the diarrhœa having existed on and off for a week or two, the symptoms of cholera suddenly develop.

Febrile Diarrhœa (Inflammatory Diarrhœa, Ileo-colitis).—In these cases, less common—that is to say, more sporadic—in my experience than the foregoing, but prevailing largely, according to Dr. Starr, in the large American towns, there is anorexia, with sour-smelling eructations, vomiting and diarrhœa. The pulse is quick, there is considerable fever (102° to 103°), and the tongue is thickly coated with white fur, the edges and tip being red. The mouth is wanting in natural moisture. The abdomen is usually full and rather tender, the motions are liquid or partly liquid and partly lumpy, fæcal or green in character, and often mixed with an excess of mucus or blood-tinted gelatinous material. Such cases occur at all periods of the year, sometimes during dentition, sometimes after unwholesome food. As the case goes on, the fever may oscillate considerably or remit; the child wastes, becomes very restless, and may ultimately sink into a state of stupor and die. One feature is that at the onset the appearances may be those of an ordinary case of temporary gastric disturbance, such as need give rise to no anxiety. But, instead of answering to the expectations of a speedy convalescence, the child drags on from day to day, becomes exceedingly irritable, and perhaps dies, or mends after the most tardy fashion. Children remain sometimes for months, after an attack of this kind, wizen and flabby and with dainty bowels. The symptoms correspond to the acute dyspepsia of some writers, to the infective gastritis, or the muco-enteritis of others. Dr. Starr considers the disease to be most prevalent in the summer months (from May to September), and to be dependent in great measure upon overcrowding, animal exhalations, and general unwholesomeness of the child's home. I am inclined to agree with him as regards faulty hygiene, for some of the most intractable cases that I have seen have been in neighbourhoods which were obviously lacking in sweetness.*

Cholera Infantum (Septic Diarrhœa) is so called because the symptoms closely resemble Asiatic cholera of the adult; that is to say, the disease is sudden in its onset, is attended by profuse watery evacuations, the infant speedily becomes collapsed, shrivelled and corpselike, and dies. To go a little more into detail: it is most prevalent in the summer months; and it is noteworthy that its seasonal maximum does not differ from that of simple acute diarrhœa. The onset is sudden, but it frequently happens that there has been an irregular diarrhœa for some days. Then the character of the ejecta changes; they become quite watery in consistence, and of a muddy or coffee colour, and very offensive, or perhaps rice-water-like and with less objectionable fœtor. The stomach at the same time becomes more or less irritable, and often rejects everything. The urine is said by S. von Hofsten to be always albuminous,† but this is not peculiar to this form of diarrhœa; it is extremely common to find a small amount of albumen in the urine of infants suffering from gastro-enteritis of any kind. The rapidity of the change in the child is startling. One or two of the characteristic motions, and as many hours, will reduce the child from comparative health to a moribund state, in which the fontanelle is sunken, the orbits scooped out, the eyes smeared with a film of mucus, the soft parts shrivelled down upon the bones, the skin hanging in folds or generally wrinkled. The abdomen is retracted, the cry an almost inaudible sibilus, and the voluntary muscular movements so slow and feeble that they come more to resemble those of unstriped muscle. The temperature in this condition is that of collapse—viz., below normal—but in the earlier stages it may rise to 105° to 108°, and should reaction become established, more or less pyrexia returns. The mortality in these cases is a very high one, according to the Stockholm Statistics 73 per cent. Many die off in a state of collapse. Improvement is known by the cessation of the vomiting and diarrhœa, if at the same time there are evidences of lessening exhaustion. The mere cessation of vomiting and the return of more healthy evacuations must not, however, be interpreted too favourably if the exhaustion has reached any extreme degree; and supposing reaction to become established, there is still a febrile stage to pass through, in which the stomach and intestines remain irritable, the tongue is dry, red, and aphthous, and for days the child hovers fitfully, and then at last, perhaps, becomes again drowsy, and sinks. The evacuations of cholera infantum have been subjected to microscopical examination, but only to find them containing epithelium and vibriones such as may be found in most cases of diarrhœa. It is difficult to say what chances of recovery remain for the worst cases, because so often summer diarrhœa runs up to, yet does not quite touch, the typical condition, and yet speedily recovers. For a few hours these infants seem to be in great danger; in another few they are almost themselves again. And it is for this reason that I do not insist more strongly upon distinct varieties of the disease. Acute diarrhœa may be of all grades of severity—from simple diarrhœa at the one end, up to the worst case of cholera at the other.

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* The reader should here refer to the second and third paragraphs in the chapter on typhoid fever. What has been said there concerning infective gastritis is equally pertinent to the subject of febrile diarrhœa from the standpoint of typhoid fever.

† Cholera Infantum at the Children's Hospital at Stockholm: Statistics of twelve years and 998 cases: *Archiv. f. Kinderheilkunde*, x. 1; *Rev. Mensuelle des Maladies de l'Enfance*, 1888, p. 467.

Any more minute description would but tend to confuse and throw the student off his guard, perhaps upon the first occasion on which he fell upon his own resources; but this much may be insisted upon, that, in order that he may have some reliable notion of the severity of the case, it is essential that the doctor should see for himself what is passed from the bowels. The late Mr. Hilton was in the habit of saying to his dressers, "Never lose an opportunity of examining a rectum." With equal force it may be said to the student of diseases of children, "Never miss an opportunity of examining any intestinal discharge." The appearances of the excreta will often give a valuable suggestion for treatment, while they will puzzle us if we have not made ourselves familiar with them.

Morbid Anatomy.—In many cases there is no morbid appearance of any sort; in others there is some slight swelling of the solitary glands and Peyer's patches; rarely some ulceration of the follicles and glands; a streaky ecchymosis here and there; or an unnatural pallor of the mucous membrane, with an excess of mucus along the canal. But these are all such appearances as may be equally present without diarrhœa, and cannot therefore be taken as certainly indicative of the disease to which the child has succumbed. On the other hand, more pronounced lesions are sometimes found, more especially in those cases that are associated with fever. S. von Hofsten tells of infiltration and fatty degeneration of the liver, and almost constant parenchymatous degeneration of the kidney. The intestinal follicles and the mesenteric glands habitually gave evidence of intense inflammation. The symptoms may not have been very definite during life, and yet after death the mucous and submucous coats of the bowel are swollen, ecchymosed, covered with an adherent layer of false membrane, and infiltrated with yellow gelatinous lymph or semi-purulent fluid.

Diagnosis.—But few mistakes are possible. An ileo-colitis may possibly be overlooked and the case considered one of simple diarrhœa. This is to be avoided by paying attention to the temperature, which is more likely to be high in ileo-colitis, and to the tongue, which is more red and furred also. Much fulness of the abdomen and abdominal tenderness might also in certain cases put one on guard. But no dogmatic statement can be made. It is conceivable also that intussusception might mislead at its onset. There is sudden vomiting; and rather profuse purging may accompany it, till the lower part of the large intestine is cleared out and blood comes. But in acute intussusception fæcal evacuations should soon cease, and blood and mucus alone be found. This, the persistence of vomiting, the probable existence of the sausage-like tumour in the abdomen, and the presence of a palpable polypoid mass in the rectum, will in most cases be quite sufficient to prevent mistakes.

Prognosis.—Simple diarrhœa is amenable to simple remedies, and generally subsides quickly, but it may give place to cholera or febrile diarrhœa. Febrile diarrhœa, or ileo-colitis, is often troublesome to arrest, and is likely to lead to chronic looseness of bowels and a seriously enfeebled condition. Cholera infantum, if pronounced, is most fatal. Severe collapse is always most dangerous. The continued presence of fever, with a red dry tongue, is also an unfavourable sign.

Treatment.—In uncomplicated cases of simple diarrhœa, and where there is an absence of collapse, a laxative, such as castor-oil or fluid magnesia, should be given at once, and milk excluded from the diet. The best drug is the salicylate of sodium, and it should be given in doses of from 1 to 3 grains (according to age) every two hours. Two grains may be given in water to an infant of nine months. Dr. Holt speaks very highly of it, and as frequently controlling severe and persistent vomiting, and I can quite endorse his opinion. Dr. Holt also speaks well of naphthalin, in doses of 1 to 5 grains, rubbed up with sugar of milk, and of resorcin in doses of ½ to 2 grains in watery solution. Some prefer small and frequent doses of the liq. hydrargyri perchloridi. Bicarbonate of soda and carbonate or salicylate of bismuth are also useful, the former for the vomiting, the latter with a little opium to check the diarrhœa and the pain. Thin veal or chicken broth or whey will form a suitable food for twenty-four or thirty-six hours, after which, if all go well, alkalinised milk and water may be cautiously resumed. Febrile diarrhœa should be treated much in the same way—viz., by a preliminary dose of castor-oil, followed by the salicylate in a simple alkaline mixture. The internal administration of the glycerine of borax, ½ drachm diluted with an equal quantity of water, is useful in these cases, and a drop or two of ipecacuanha wine may be added to either mixture with advantage. In some cases a minute dose of Dover's powder with bismuth relieves the pain in the abdomen and procures sleep.

In the more severe cases, with pronounced intestinal inflammation, the chief aim must ever be to sustain the child by suitable nourishment, and if need be by stimulants, so as to allow the disease to run its course and reparative action to take place. The return to milk must be very gradual, and the added milk should in all cases be sterilised. In cholera infantum, when the purging is profuse and very liquid, associated with vomiting and much collapse—the symptoms which specially indicate infantile cholera—a warm bath and sometimes a mustard bath should be given at once; if the latter, about a tablespoonful of mustard to the gallon of water is used, and the child is kept in it till the nurse's arms tingle. It is then to be wrapped in blankets and kept very warm in the arms or by hot bottles. Sometimes the choleraic symptoms are associated with very high temperature, 105° to 108°, in which case the tepid bath or cold pack is to be employed frequently. The child may be put into a bath of 85° to 90°, the temperature of the water being lowered to 80°, and may be kept in it five minutes, then wrapped in a blanket, and the process may be repeated every three or four hours if necessary. The cold bath was recommended by Trousseau as a means of subduing nervous symptoms, and lately its employment has again been advocated in summer diarrhœa associated with high fever, but it is of questionable value for babies.

The internal treatment in these severe cases will depend upon the existence or not of urgent vomiting. If this is very slight, small doses of castor-oil may still be given. They will speed onward any noxious matters in the intestine without increasing the state of collapse. If the vomiting is incessant, half-grain doses of hydrargyrum c. creta or one-sixth grain doses of calomel should be given every hour for three or four doses. Henoch speaks highly of hydrochloric acid in small doses and also of creosote (F. 20). For my own part, I now give salicylate of soda on the antiseptic hypothesis, as in the milder cases; but the disease is so severe, and the general disturbance of function so quick and so crushing, that under any known method it still retains a sad fatality. Braithwaite recommends a mixture of salicylate of soda and sulphate of iron, a grain of each every hour till the stools are well blackened, and then the same dose at intervals of three or four hours. Another remedy which promises well is a tincture of coca, made by adding one part of leaves to five parts of absolute alcohol.* From five to twenty drops are given at frequent intervals according to age (in every case under two years), and improvement generally sets in when 50 to 100 drops have been taken. Brandy must be given in doses of twenty to thirty drops every two, three, or four hours, as may be necessary. Ether may be substituted in drop doses in syrup, and for hospital patients I often order rectified spirit. It can be given either with the medicine or mixed with an aromatic water separately. In the worst cases a speedy temporary rally may be obtained, and time gained, by a subcutaneous injection of ten drops of brandy diluted with water.

Food is to be administered in the smallest quantities, and of all others whey, if it can be procured quickly enough, is the best.

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* Pott and Diderich, *Jahrbuch f. Kind.*, 1886.

Barley-water, the *eau albumineuse* of Trousseau,* or thin veal or chicken broth, are all useful in their turn. If no food can be retained, however dilute, plain water should be tried; in a state of desiccation such as this, it is by no means devoid of use. The point in giving directions for the feeding is to beware of doing too much, and so bringing about a recurrence of the vomiting. A teaspoonful is a small quantity, but a teaspoonful retained is better than a tablespoonful vomited.

If even water cannot be retained, improvement may result from the subcutaneous "infusion" of sterilised water. As much as seven or eight ounces of sterilised water or, perhaps better, of saline solution (one drachm of sodium chloride to a pint of boiled water) can be "infused" in under the skin at the back of the thorax; the needle from an ordinary exploring syringe is connected by a piece of rubber tube with a narrow glass funnel—for this latter part of the apparatus the barrel of an ordinary glass syringe, capable of holding about an ounce of water, serves admirably, as the mouth of the funnel can easily be stopped with absorbent wool to prevent contamination of the solution during the process—the whole apparatus, after being thoroughly sterilised, is filled with the saline solution at a temperature of 100° F., and the needle is pushed well into the subcutaneous tissue, and held there whilst the fluid runs in; the funnel is kept constantly filled up until the required quantity has been introduced; the introduction of six or eight ounces may take an hour or longer. Of course the strictest antiseptic precautions must be observed in the preparation of the skin, as well as of the fluid and apparatus. The improvement which follows immediately upon the introduction of several ounces of fluid in under the skin in this way is often very striking. A mixture of white of egg and water (1 in 6) has also been used, but is more likely to produce inflammation.

Another method of treatment which is sometimes of great value in this and kindred intestinal diseases, is intestinal irrigation. Copious enemata (a pint or more) of warm, tepid, or cold water are allowed to flow into the bowel under a low pressure from some handy reservoir, or are carefully introduced by Higginson's syringe, the child lying on its back with its buttocks raised. If any straining occurs the injection is stopped.

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* The white of two eggs is diluted with a pint of water, sweetened and flavoured by some aromatic.

As a last resource the intravenous injection of normal saline solution may be tried; but this is often a difficult proceeding in an infant, and though one has occasionally seen temporary benefit from it, the results have usually been disappointing.

Chronic Diarrhœa is very generally insidious in its origin. It often happens that not till months after its commencement, and not till emaciation has made some progress, is the child brought for treatment. In reply to questions, we are told that the bowels have always been loose—perhaps what began as an acute diarrhœa has become persistent. Sometimes the attack has been the outcome of one of the exanthemata; but, however this may be, the child is brought because "as soon as any food is taken it goes through it," and also for some imaginary enlargement of stomach, these being indications to the mother of "consumption of the bowels." It is but seldom, however, that this popular diagnosis is correct; and in at least nine cases out of every ten, consumption of the bowels means no more than the disorder attendant upon improper feeding.

Causes.—Chronic diarrhœa occurs for the most part in the ill-kept children of the poor of large towns; in infants whose mothers are out at work all day long, and who are consequently fed on anything on a week-day, and probably, as a treat on Sundays, on a little of everything that the parents eat. It is found in the unwashed, with a skin choked with perspiration, dirt, and urine; in the ill-clothed, with a surface repeatedly exposed and chilled:—in all, in fact, who breathe bad air, are fed on bad food, and live under conditions hygienically faulty. In the children of the well-to-do it usually results from improper feeding—not necessarily from food intrinsically bad, but rather from such as is ill-adapted to the particular case. In many of the children in this class of society the greatest care and forethought have been exercised; still there is something wrong in the food or in its method of administration. Chronic diarrhœa is also specially frequent in rickety and syphilitic children, and is also likely to begin in any who may be recovering from measles, whooping-cough, or other debilitating disease.

Symptoms.—The early history of cases of chronic diarrhœa can but seldom be obtained from that class of society which furnishes the most abundant examples; but from such children as have been under careful observation, it would appear that an acute attack of diarrhœa, febrile or other, acute disease of one kind or another, or exposure to cold, are its usual precursors. There are many children, moreover, who are voracious from birth, who take their food with great rapidity, take more than is requisite, and who show symptoms of indigestion and suffer pain afterwards. Any of these conditions will lead to diarrhœa. The motions are at first abundant, without being very abnormal. Very gradually they lose their colour and consistency, the child losing its plumpness, and dwindling. The motions may at first be pultaceous and abundant; lumpy, with a quantity of mucus; or grumous and more like pus. But in the last stages they become more and more frequent, amounting sometimes to twenty or thirty in the twenty-four hours; more liquid; more offensive; and the colour changes to reddish or to a dirty brown water containing green particles—"like chopped spinach," an apt comparison—which are considered to be altered blood. The child meanwhile slowly wastes—for a long time, by a negative rather than a positive process, the infant growing older but not larger. For long it is supposed to be rather bad-tempered than ill, for in the interval of the abdominal pains it may be bright and cheerful; but by-and-by the emaciation cannot be overlooked—it becomes continuous, till in extreme cases only a living skeleton remains. The skin is brown and dry, hanging in folds upon the body and wrinkling the brow: the buttocks become covered with an eczematous rash; the face is pinched and monkey-like; the cry, a hardly audible whine; the tongue red and dry, rasp-like from the prominences of the papillæ, and covered with thrush; and the abdomen, moderately distended by flatus, shows the intestinal coils visible through the thinned parietes, and the peristaltic action clearly discernible. Visible peristalsis has not the same signification in children that so often attaches to it in adults. It may mean an excessive activity of the muscular coat of the bowel, but not that the muscular coat is hypertrophied; it may be seen in many an emaciated child without any intestinal obstruction being present. If the diarrhœa be not arrested by treatment, the child gradually becomes more feeble and sinks into a semi-comatose state. The temperature falls below normal; the feet and hands are cold; and it either succumbs to gradual exhaustion or else some complication occurs—perhaps convulsions, perhaps broncho-pneumonia or pleurisy. The child is, however, often in so feeble a condition before the final event that such things create few if any fresh symptoms, and they are liable to pass unrecognised until a post-mortem examination reveals them. Besides these, there is a liability to eczema, impetigo, and ecthyma; and even gangrene of parts of the surface has been recorded. Such is the history of chronic diarrhœa; in infants—an affection that may last from three or four weeks to as many months, or even longer. In older children—that is to say, from two years upwards—it is found under three conditions of somewhat different import:—1st. As a state of irregularity of bowels rather than diarrhœa, the motions being often loose, but not unfrequently confined and lumpy. The diarrhœal stool is bulky, loosely pultaceous, dark brown in colour, and offensive. This is due to want of regularity in diet, and in certain cases, where undigested food appears in the evacuations, has received the name of " lienteric diarrhœa." This form is often associated with threadworms. It is associated also with a certain flabbiness of muscle and fat, but hardly ever with any serious wasting. 2ndly. There may be much wasting and abdominal discomfort, the abdomen being a little full and the motions muddy and offensive, in which case it is likely to be due to ulceration of the intestines and tabes mesenterica. 3rdly. There may be little wasting, but more pain—the griping coming on almost as soon as any food is taken into the stomach, and the evacuations consisting of undigested food and mucus—a condition which appears to be primarily associated with some disorder of innervation (*Diarrhée nerveuse* of Trousseau), for it is excited immediately by the contact of food with the gastro-intestinal mucous membrane. Prolapse of the rectum is liable to occur in any case of chronic diarrhœa, but is more common in children of two to six years than in infants.

Morbid Anatomy.—The coats of the stomach and intestines are pale and thin, having suffered from the general atrophy, while the mucous membrane of the lower part of the small intestine and of the colon is covered with black points, giving a cut-beard appearance which is due to altered blood pigment deposited around minute ulcerations of the solitary glands and follicles. There may in addition be more or less superficial erosion of the mucous membrane, a streaky appearance from irregular turgescence of the capillary plexuses, with swellings of parts of the Peyer's patches; and, lastly, some cases prove to be overlooked examples of tabes mesenterica, with thick-edged or ragged ulcers infiltrated with yellow material, and perhaps with distinct tubercles on the peritoneal aspect. Microscopically, Dr. Soltau Fenwick has shown that in many cases where the naked eye detects no change there are definite structural lesions. The early stage is a round-cell infiltration of the mucous membrane; this leads to the development of fibrous tissue, which gradually presses on and destroys the glands and eventually completely replaces them. In this way a cirrhosis of the mucous membrane occurs which renders it first partially and then entirely unable to fulfil its function.

These changes, found both in the stomach and in the intestine in cases of subacute or chronic gastro-enteritis, afford a very natural explanation of the difficulty of cure, and account also for the slow return to a state of normal nutrition where recovery takes place, and for the prolonged stunting of growth that is occasionally seen after recovery.

It sometimes happens that a chronic catarrh may end in a more acute process. Thus it is that occasionally the unsuspected presence of acute enteritis is revealed after death. Bronchitis, broncho-pneumonia, or atelectasis are the more common affections found in conjunction with the intestinal lesions. The more or less comatose condition which so often comes on before death has been found occasionally to be due to thrombosis of the cerebral sinuses; but this is a rare occurrence, and the symptoms are probably more often due to the slowing of the circulation and the feeble nutrition which ensues, or possibly, as Parrot has suggested, to toxæmia ("Clinique des Nouveaux-nés").

Diagnosis.—It is desirable if possible to come to a conclusion whether the diarrhœa is due to tubercular ulceration or not. The existence of small follicular ulcers cannot be diagnosed with any certainty, but the larger tubercular or scrofulous ulcers may be suspected in any child over two years in whom the diarrhœa is obstinate and there is much wasting. Of late years it has been the custom to teach that tubercle is a much commoner disease in infants than had been thought, and so, no doubt, it is; none the less it remains true that, of all the cases of chronic diarrhœa met with in children but few are tubercular under eighteen months. After two years the question of tubercle must be carefully considered. Much pain after taking food, associated with a persistently brown watery offensive motion, is in favour of ulceration, and so also, with other symptoms, is any unusual excess of borborygmi in the intestine. Tubercular ulceration of the intestine has so much tendency to mat together the coils of intestine, and thus to hamper their action, that some functional disturbances of this kind may certainly be expected. These points, and a careful observation of the temperature, will generally suffice. A polypus in the rectum leads to a discharge of blood and mucus, which is sometimes characterised by the mother as diarrhœa. An examination of the rectum settles the diagnosis.

Prognosis.—This must depend upon the result of treatment. If the diarrhœa lessens and the motions become more consistent, then a favourable termination may be hoped for. The older the child the better the chances. Much dryness of the tongue, with redness and enlargement of the papillæ, accompanied by thrush, and any œdema of the feet and ankles, are of the worst augury.

Treatment.—To take the case of older children first, and excluding the possibility of tabes mesenterica, the diarrhœa which is due to irregularity of diet must be counteracted by paying attention to what has before been neglected. Children thus affected must be strictly treated, but they require some slight preliminary purgation, to clear away indigestible and improper material from the intestinal canal. For this purpose Formula 12 is a serviceable one. A teaspoonful to a tablespoonful of fluid magnesia may be given instead, if preferred, twice or three times in the day, and for a more active aperient a small teaspoonful of liquorice powder or a piece of a Tamar Indien lozenge may be given. Subsequently a little sulphate of magnesia may be combined with sulphate of iron, as such children are often anæmic, and require iron (F. 23).

For the "nervous diarrhœa" nothing acts so well as small doses of Dover's powder. It is a disease particularly of children five to ten years old. Two, two and a half, or three grains may be given three times a day in a little milk, and an hour or so before meals.

A little liquid extract of opium may be given in fluid magnesia, with sulphate of iron, as a useful way of combining the opium with a tonic, and at the same time avoiding any too costive effect. The iron is precipitated as green carbonate, but this does not in any way impair the result (F. 24).

Dr. Lewis Marshall thinks highly of the salicylate of lithia in these cases, and the salicylate of bismuth is also prized nowadays for similar use. A mixture of potassium bromide with belladonna is also very useful.

Easton's syrup, in doses of twenty or thirty drops three times a day, may be given afterwards (syrupus ferri et quininæ et strychninæ phosphatum). It is, I think, better than the more usually prescribed chemical food under these circumstances, being less liable to upset the stomach. Arsenic is another drug which is of great service in combination with other tonic remedies.

Chronic Diarrhœa in infants requires the expenditure of much thought and trouble if the treatment is to be successful. It is often obstinate, and improvement even in favourable cases very fitful. The treatment comprises diet, general hygiene, and medicine. The diet must be regulated upon the lines already laid down for children in health. Chronic diarrhœa is so much a disease of bad or too abundant feeding that the first duty will probably be to see that starch is eliminated from the diet, or that milk is taken in reduced quantities. If milk should disagree, as it is liable to do even when diluted largely with water or lime-water, milk and rice-water may be tried, and then whey or thin veal broth. But whatever is given must be in very small quantities, sometimes only a few teaspoonfuls, so as, if possible, to allow of digestion without starting the intestines into muscular action. If under these circumstances the child gains in weight, and the motions become more coloured with bile and more solid, it will probably get well; but the food must be carefully regulated and only slowly increased in quantity. As the gastro-intestinal tract becomes more tolerant, so the quantity of food given may be increased, the frequency of the meals decreased, and milk food be gradually reintroduced. In the worst cases all natural food must be stopped, and raw meat given instead. The directions given by Trousseau are as follows :—Take a lean piece of beef or mutton, and, after cutting it into small pieces, reduce it to a thick pulp with pestle and mortar. The pulp so made is passed through a fine sieve, which will allow nothing to pass save the juice of the meat and fibrinous matter. This is scraped from the external surface of the sieve and sweetened. To begin with, a teaspoonful may be given three times a day; the quantity being gradually increased till five or six ounces are taken in the course of the twenty-four hours.

Raw meat is generally taken by young infants with avidity, but in older children it creates disgust, even when well sweetened. It is then to be given stirred up in a little cold veal broth or thin barley-water. It will usually be readily taken in this way when refused as a pulp. If not, it may be mixed with chocolate made with water. At first the meat appears unchanged in the stools, but it soon alters, and becomes partially and then entirely digested, the child gaining in weight in proportion.

In what may be called general hygiene the child must be kept warm and clean. It should be wrapped in flannel and carefully guarded against cold feet and a cold stomach. It should be kept in one temperature, but in as pure air as possible, and all soiled linen should be removed from it at once. Medicines are comparatively of less value. They are by no means to be omitted, but careful diet and warmth are the essentials. Of drugs, opium is the most generally useful, and this may well be combined with logwood, ipecacuanha, and chalk, as in the mistura hæmatoxyli co. of the Guy's Hospital Pharmacopœia (F. 25). Castor-oil in doses of four or five minims, emulsified with ten or fifteen drops of mucilage in a drachm of dillwater, is often very effectual if given regularly three times a day; and the efficiency of the mixture may be increased by adding ¼–½ minim of tinct. opii, according to the age of the infant. A teaspoonful should be given every four hours if the diarrhœa is profuse, and less frequently according to circumstances. Another useful remedy is bismuth: but it must be given in efficient doses, five grains or even more of bismuth carbonate should be given as a dose to an infant of twelve months; it may be administered suspended in mucilage, or as a powder with which a small dose of bicarbonate of soda and a little aromatic chalk powder may often be usefully combined. Tannigen may be administered in the same way, a grain for an infant of six months; and in the hands of some physicians this drug has seemed to be of value. Tannalbin, also, two or three grains, mixed with a like quantity of aromatic chalk powder, is sometimes useful. For these cases, too, the tincture of coca, already described on p. 94, or the extractum cocæ liquidum in doses of five minims for a child of two to five years may be used. Money recommends acorn cocoa, a preparation made from ordinary cocoa, deprived of its fat, and the soluble parts of roasted acorns, as a valuable remedial food. A teaspoonful is given three times a day, made as cocoa, but with water in place of milk.

Santonin, a couple of grains given on alternate evenings two or three times, is sometimes useful. Dr. Starr recommends nitrate of silver by the mouth suspended in syrup and mucilage. It may be given in doses of one twenty-fourth of a grain every two hours to a child two years old if the diarrhœa is obstinate, the mouth aphthous, or thirst or prostration extreme.

Sometimes astringents are useful—gallic acid, sulphate of copper, acetate of lead, may any of them be used according to the formulæ given (F. 27, 28, 29).

Astringent enemata are recommended by some. They are not often retained, and are but seldom of use. Nitrate of silver, one grain to five ounces of water, is recommended by Trousseau; but on the whole a starch and opium enema is perhaps preferable —two or three drops of the latter to two ounces of the vehicle. But we now seldom resort to medicated enemata, simple intestinal irrigation, as described at p. 95 is in our opinion more generally useful.

Dysentery (*Acute Colitis; Ulcerative Colitis; Membranous Colitis*).—This term is applied in England sometimes to chronic ulceration of the colon, sometimes to acute inflammation with the formation of diphtheritic membrane. In either case it is a disease which rarely attacks children, though it appears to be less rare in infancy than in later childhood. Extensive ulceration of the colon in a child is almost always due to tubercular disease, though it is possible that it may be an occasional result of chronic diarrhœa.

The symptoms in these cases of acute colitis, or dysentery, are usually diarrhœa, associated with much fulness and sometimes tenderness of the abdomen, and with considerable pyrexia, which is often more or less continuous, the temperature ranging from 102° to 104°. The stools in some of our cases have contained mucus and blood, but in others they have only been green and offensive, and in others again simply yellow and loose. There is much prostration, and the disease may prove fatal by exhaustion.

This affection is so often associated with other lesions that its duration is not easy to determine, and it is often difficult to say how far death is due to the bowel condition. We have noticed especially the association of a very intense bronchopneumonia with it, and in one case we found also a membranous inflammation of the œsophagus (apparently not a true diphtheria so far as could be judged from the absence of the Klebs-Loeffler bacillus on culture) associated with an intense inflammation of the colon and a patch of membrane in the descending colon, in an infant aged twenty-one months. In a child of two and a half years, whose illness had begun in India, and who had been suffering with diarrhœa, passing mucus and blood, and vomiting for twelve months, we found irregular patches of membrane from the transverse colon down to the lower part of the rectum; in this case also there was an intense pneumonic consolidation of part of the right lung. In another case, an infant of ten weeks, who died after a fortnight's illness, the mucous membrane of the large intestine from the ileo-cæcal valve to the rectum was honeycombed by superficial ulcers, which were transversely placed, and had a white base as if they had been touched with silver nitrate. We have only once seen a case of acute colitis in an older child. The patient was a girl, aged eleven years, who had been living badly. She was extremely prostrate, pale, and covered with a purpuric eruption. Her temperature was 100·8°. The spleen was large. The bowels were confined at first, but the evacuations soon became watery, and pink from the presence of blood, and she sank rapidly, the temperature rising to 105·6°. The blood showed a reduction of more than one-half of the corpuscles and of 65 per cent. of the colouring-matter. At the inspection, the lower part of the colon and the rectum were the seat of a severe diphtheritic inflammation. The mucous membrane was swollen, coated with thick adherent membrane, the surface beneath being ecchymosed and bleeding.

Such cases, when they occur, must be treated like bad cases of acute ileo-colitis. For instance, some good may be derived from warm or cold applications to the abdomen. One or other of the various meat-juices may prove of value as food; and as drugs, small doses of ipecacuanha—either frequent drop doses of the wine or grain doses of the powder—or the tincture of coca, or glycerine of borax, or bismuth, may be recommended.

For the less severe and more chronic cases, the dilute mineral acids, quinine, &c., may be of use; and any of the suggestions that have been made under the head of Treatment of Chronic Diarrhœa.

Abnormal Stools.—There yet remain a few things to be said of **stools**, which may come here as fitly as anywhere. A large number of children, mostly from five to twelve years of age, are brought for advice chiefly because the fæcal residue is wanting in natural biliary **colouring** matter. With this there are certain associated symptoms—lassitude, capricious appetite, unhealthy pallor, darkness round the eyes, foul breath, and bad sleep. These are usually at first ascribed to worms, and a vermifuge given, but, none appearing in the evacuations, they are then put to the credit of a sluggish liver. According to my own experience, however, the liver may be doctored persistently with very little chance of a good result, and the evacuations continue pale in spite of our efforts. The treatment of these cases is emphatically not alterative, but dietetic, hygienic, and tonic, and by such means health is regained and the bile imperceptibly improves in quality. Dr. Cheadle has given the name "acholia" to some cases in which the stools are clay-coloured and have a greasy appearance and particularly offensive odour. There is excess of fat in the stools, and it is suggested that the condition may be due in part to some disorder of pancreatic secretion. He recommends limiting the fats, starch, and sugar in the diet, so as to throw as little work as possible on the liver and pancreas.

One sometimes hears, too, of the large **size** of the stool, even in young infants—a fact this of no great clinical value, although sometimes perhaps, in association with other symptoms, it may lead to the suggestion of imperfect absorption, and thus to a diagnosis of perhaps mucous disease or tabes. (*See also* p. 109.)

There is no need to repeat here what has already fallen under the head of Chronic Diarrhœa, nor need more than a slight mention be made of the common anxiety which is expressed by so many mothers at the black colour of the motions when children are taking iron or bismuth salts. These are such common remedies for all sorts of ailment in children, that every student is familiar with the inky appearance of the motion produced by them. But the passage of blood is sufficiently common to require special notice, and various undigested or partly digested substances produce peculiar appearances which may well receive special mention.

Blood may be passed unaltered, or resembling treacle or pitch (melæna). Fresh blood is a common constituent, especially during infancy ; it comes from the lower part of the bowel and is most often the result of constipation, though it is not infrequent with diarrhœa ; it occurs also in association with the irritation set up by ascarides, or by threadworms, and with the local congestion and straining which result from prolapse of the rectum ; in all these conditions the amount is usually small, perhaps a streak or two of bright red blood with each stool ; when it is passed in larger amount it is sometimes due to polypus. Hæmorrhage from the bowel is occasionally a manifestation of the hæmorrhagic tendency in infantile scurvy, and may indeed be a prominent symptom ; it is also seen in purpura, especially in the more severe cases. Blood is occasionally passed in quantity, and even in clots, without other cause than the presence of indigestible food in the alimentary canal. The following case is an example of this :

A child, aged seventeen months, had been fed upon meat and potatoes and arrowroot. Five days before she was brought to the hospital she began to pass blood, and afterwards some came away at every action of the bowel, sometimes in clots. Some straining occurred with each action, and she turned very pale. Nothing abnormal was to be felt in the abdomen, nor was there any polypus or other cause for the bleeding to be felt per anum ; and it was therefore concluded that the diet was at fault. Careful feeding was ordered, and a mixture containing bicarbonate of potash, fluid magnesia, and tincture of rhubarb and cinnamon-water, and the bleeding ceased.

It also occasionally happens that a small ulcer in the colon or elsewhere, in typhoid fever, or in children who are otherwise ill, comes across the line of a small vessel, and leads to hæmorrhage ; but the pre-existing indications of disease would be, in such a case, sufficient to render a diagnosis possible : the hæmorrhage would have nothing in it to take it out of the category of a similar bleeding in adults under like circumstances ; and the treatment would follow the same lines.

Occasionally yet other cases occur in which a sudden and profuse intestinal hæmorrhage occurs, associated with alarming collapse, maybe with an initial vomiting and diarrhœa. Three or four such cases have come under our notice; they have each of them looked threatening at the onset, but all recovered. It is hard to say exactly what happens in such cases, and how the hæmorrhage occurs.

As a cause of blood in the stools, **Rectal Polypus** is not rare. It may lead to persistent and occasionally severe hæmorrhage from the bowels, and when, as is sometimes the case, it is unrecognised and the bleeding continues a long time, a child may be completely blanched by it. The polypus is usually solitary, pedunculated and projecting from the mucous membrane some short distance above the internal sphincter. They are firm fleshy bodies, composed of villous processes and crypts covered and lined by columnar epithelium, and in section they form beautiful microscopic objects. Although such polypi are nearly always solitary, I have twice or three times seen the whole of the rectal mucous membrane covered by them, when naturally the disease is a serious one.

Treatment.—The forefinger, well oiled, should be passed into the rectum, the polypus hooked down, and its pedicle frayed through with the nail. Polypi are, for the most part, easily detached. Should there be any difficulty in removing them in this way, or the growth be large, they must be ligatured; but this is seldom necessary.

Melæna Neonatorum is not a very infrequent occurrence, and there has been considerable discussion as to the source of the blood. In the only case that I have examined, a small oval ulcer had opened into an artery at the cardiac end of the *greater* curvature of the stomach. But this is perhaps an exceptional condition; at any rate, the majority of cases have been supposed to be due to venous congestion; a minority only have been proved to be due to ulcer. In typical cases, within a few hours of birth the infant either vomits blood or passes a quantity per anum, and sinks within a short period. The case alluded to occurred in the practice of Mr. J. Cock, now of Exmouth. The child was born naturally, and was to all appearance healthy. About twenty-four hours after birth it began to pass black blood per anum, and vomited blood from the mouth, and it sank six hours afterwards. It is a very serious affection, and in most cases fatal. Indeed, it hardly gives an opportunity for treatment; but should it do so, some cold alum whey (F. 38) might be given, and some castor-oil, which by acting upon the bowels would do something to relieve any local plethora which might exist. We should certainly try also the internal administration of one of the various preparations of suprarenal gland which can now be obtained easily in tabloid or other forms; Holt and others have recorded success from this treatment. Less useful, because less readily available, is the hypodermic injection of a 2 per cent. solution of gelatin; injection of 15 cc. of such a solution, which had been boiled for six hours and allowed to cool to about 100° F., was followed by recovery in five consecutive cases (Holtschmidt). Dr. West narrates two cases of melæna in somewhat older children, in which the bleeding was perhaps due to some impoverished state of blood; and it may be added that no age is exempt from ulcer of the stomach, though it is far less common in infancy and childhood than in later years.

Green stools are usually said to be due to altered blood; but grass-green evacuations are quite common in acute and sub-acute diarrhœa in infants—so much so that there must be other sources than blood. Moreover, the vomit of adults is often green, and then certainly composed of bile, and there is no reason to doubt that a green bile passing rapidly along the intestine under conditions of diarrhœa is an adequate explanation of some cases. M. Hayem also contends that a green colour is produced by a substance developed by a particular bacillus, and this he maintains is contagious. Some stools passed yellow rapidly become green from biliverdin. This change implies (Donkin) an alkaline condition in some part of the alimentary canal which is abnormal in infants wholly fed by breast.

Oily matter is occasionally passed in quantity from the bowels; the evacuations being, at the same time, very offensive. This condition is probably due to defective action of the liver, pancreas, and intestinal glands, under which the fatty matters of the food are not properly emulsified, and therefore not absorbed. Such cases Dr. Cheadle would include under the term "acholia" (*vide* p. 105). There is no experience at hand sufficiently large to warrant one in saying what is the best medicinal treatment for such cases: but the symptom has disappeared under restricted diet, particularly the limitation of fat and carbo-hydrate food, and probably, in cases of any obstinacy, the artificial digestion of the food by the liquor pancreaticus or peptonising pellets would be of service. There is also some use in sodium bicarbonate, or sulphate of magnesia and sulphate of iron, for this condition.

When, from any cause, it is necessary to feed children upon unusually large quantities of milk, the motions sometimes contain a yellowish and greenish thick fluid, not at all unlike thick pus, due to **partially digested milk.** I remember a case of empyema where the appearances were so like those of pus as to lead to the supposition that the pleuritic abscess had opened into the colon through the diaphragm. But there was no other reason to suppose that this was so, and microscopic examination showed the material to be fatty. Semi-digested curds also sometimes assume puzzling forms which may resemble skins or worms.

The indication in any such case probably is that the absorption limit has been overstepped and that waste is going on. The milk should, therefore, be lessened in quantity.

The **bulk** of stools is a point that will occasionally help us in unravelling the nature of a disease. I have several times had my attention called by doctor, parent, or nurse, to the enormous quantity of fæcal material passed in the twenty-four hours, and, upon further investigation, it has been quite clear that very little of the food ingested could have been absorbed. I have seen it in "mucous disease"; in what I have supposed to be simple chronic intestinal catarrh; and it is quite conceivable that it might occur in some otherwise undeterminable disease of the abdominal lymphatic system, such as tabes, which is obviously inimical to the absorption of food. The actual value of the symptom must be determined by the collateral evidence available in the particular case.

Mucus is another common constituent of stools, and, when not in quantity, a natural one. It is found in excess in many cases of chronic constipation—the continuous presence of scybala no doubt worrying the mucous membrane into an inordinate secretion. It is also present in large quantities in acute and chronic catarrhal states, and also in association with worms. But in all these its presence is accounted for by the existing malady, save perhaps by worms, which may well be fostered by the pre-existing catarrh. There is, however, a large group of cases where it is supposed to play a more prominent rôle, where it is no longer a subservient, but a factor of symptoms. In such a case there is little or no fever, but the tongue is furred, the breath foul, the appetite capricious, the bowels irregular, and superadded is a frequent dry hollow cough, which is often called a " stomach cough." The condition upon which these symptoms depend is a very indefinite one, if we attempt to treat of it pathologically, but distinct enough as a clinical fact. We have a dull, languid state, with opaque and greasy skin, pallor and wasting. The tongue is flabby, moist, and covered with a whitish fur; the appetite is capricious—sometimes ravenous, sometimes dainty, sometimes replaced by an inordinate thirst. There is a liability to severe stomach-ache, which in some children attacks them when they wake in the morning, in others appears to be excited by the ingestion of food. The bowels are perhaps confined and relaxed alternately for days together. The constipation may attract but little attention, but the diarrhœa, particularly if combined with vomiting, makes the parents anxious. The child is said to be subject to bilious attacks; or a dry, hollow, frequent cough frightens every one around into the idea of consumption. Nor should this cough be passed over without alluding to the close sympathy that exists between the stomach and the lungs. The diseases of the one organ are so frequently reflected in perverted functions of the other, that it is quite worth while bearing the fact in mind.

It must not be supposed that all these symptoms are to be found in any one case. Some children will require treatment for griping abdominal pain of a paroxysmal kind, others for bilious attacks, others for pain in the side, others for cough, yet others perhaps for nightmare; but when we come to investigate cases, certain other features are found in common—viz., pallor, wasting, furred tongue, foul breath, irregular bowels, &c. Now these are all symptoms which might be due to a great variety of causes, and they are not associated with any certain anatomical lesions. Nevertheless, as a group they have much constancy, and it becomes necessary to assign them a place, and for purposes of recognition a name also, amongst gastro-intestinal disorders. Dr. Eustace Smith, in his " Wasting Diseases," proposes the name "Mucous Disease." He considers a soft, flabby, indented tongue, smeared over with a gumlike mucus, to be particularly characteristic; and the side pain, stomach-ache, &c., to be due to accumulations of mucus in the bowel, and its evacuation to be the cause of the periodical diarrhœa. As an accurate picture of the affection we are now engaged upon, the student cannot do better than read the chapter referred to in Dr. Eustace Smith's book.* Given the existence of an excess of mucus, which no doubt is present in some cases, it would, as Dr. Eustace Smith points out, hinder the proper absorption of the ingesta, and lead directly to the wasting and other evidences of disturbed nutrition that are found in these cases. Occasionally not only does one find mucus, but casts in the form of regular tubes in greater or less length are shed from the surface of the bowel; these are not so common in children as they are in adults. Many years ago, Mr. E. U. Berry sent to me, at the College of Surgeons, several specimens of mucous casts which had been expelled from the bowel of a woman under his care. They were perfect casts of the mucous membrane. She had been passing them for years, and she still continues so to do. She is a poor, ill-nourished thing, "doing no credit to her victuals," as her friends might say. She preserves throughout a sort of low-water existence, always ailing, plaintive, but never seriously ill, and is, I daresay, destined to live, notwithstanding, as long as the average. (*Path. Soc. Trans.* 1872.) I have seen many cases of similar kind since then. They always occur in the nervous temperament, and are commonly supposed to be a "mucous colitis," but it is quite certain that there is no true inflammation of the mucous membrane; the material expelled is an excessive or altered secretion only.

In vol. ix. of *Path. Soc. Trans.* is a similar case previously recorded by Mr. Hutchinson, and in many respects this affection, no doubt, resembles the so-called "mucous disease" of childhood.

Nevertheless, I have no great liking for the term "Mucous Disease"—first, because I have not been able to satisfy myself of the discharge of any such large quantities of mucus from the bowel in many cases; and, secondly, because, were it so, there must still be some cause behind it.

For my own part, I am persuaded that, although they may seem to be caused by temporary conditions, such as errors in diet, these varied pains and aches are often but the expression of a constitutional build. They are an evidence of nervous instability, and they are found in nervous children of nervous families. By this I mean that children subject to these ailments are the offspring of those whose nervous systems are feeble or diseased; of those who have themselves or their near relatives suffered from fits, insanity, hysteria, neuralgia, rheumatism, or gout; or, if not, have in themselves given other evidence of unstable nerves in the convulsions of infancy, passionateness, morbid timidity, chorea, or rheumatism. Such children have nightmare badly, somnambulism, and nocturnal incontinence of urine. Their moral nature is essentially angular. They are an odd lot. The gastro-intestinal disturbances that are met with have much in them to suggest a nervous origin. The insignificance of the exciting causes, the suddenness of the attack, the suddenness of its subsidence, the nature of the attack in many cases, even the presence of an excess of mucus—if that be a dominant symptom—each and all of these symptoms are compatible with enfeebled nerve control.

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* "Wasting Diseases," sixth edition, p. 210.

Diagnosis.—The abdominal pains which so often form the striking feature of the complaint are very similar to those present in many cases of early tuberculosis, or tabes mesenterica, and these disease are not always easy to distinguish. Mesenteric disease should be characterised by a greater fulness of abdomen, more persistent pain, less constipation, more wasting. On the other hand, tabes in its earlier stages is very liable to be overlooked if abdominal neuroses, with their fascinating capacity for fitting all measures, are allowed to usurp an undue proportion of the observer's imaginative faculties.

Treatment.—On general principles these children require most careful feeding—not only must the material be supervised, but also the amount taken and the way in which it is taken. They are to have plenty of milk; bread, sugar, and butter in moderation; meat and fish; but vegetables only in small quantity. Potato may be given if it is carefully purêed with milk so as to be almost fluid, but not otherwise. Bolted potato is very trying to a child's stomach. Tonics are usually requisite, of which tartrate of iron, with bicarbonate of potash, āā gr. v, syrup and water, is very generally suitable (F. 32).

Dr. Eustace Smith insists on the necessity of strictly curtailing, or for a time stopping, the starchy elements of the food in cases of mucous disease, and at the same time of putting the child on alkalies and nux vomica, and the value of this treatment is now very generally recognised.

But the special symptoms require special treatment. The abdominal pains which are so common are almost invariably relieved by small doses of Dover's powder. They are not common in children under three or four years of age, so that two or three grains of the powder may be given twice or three times a day in most cases, and in older children four or five grains may be necessary; and this treatment should be continued for at least ten days or a fortnight.

For the various other pains and aches, bromide of potassium or ammonium is most generally suitable, and it may sometimes be advantageously combined with half-drachm doses of the syrup of chloral.

In the bronchitis of the larger tubes a little tinct. camph. co. forms a useful adjunct to the aperient medicine, and perhaps hastens the return to a normal state; and in all cases the bowels must be kept open by some mild aperient, than which none can be better than the compound decoction of aloes or five-minim doses of tincture of podophyllin. A tablespoonful or two of Friedrichshall or Condal water taken in the morning in a little hot milk and water is another purgative which some children take well; also the effervescing salines, provided that the ebullition of gas be partly spent. Later on, strychnine may be combined with the iron, either as the liquor, the tincture of nux vomica, or as Fellows' or Easton's syrup.

CHAPTER VII.

WORMS.

FIVE varieties of worms infest the alimentary canal of children —the oxyuris vermicularis, the ascaris lumbricoides, the tænia mediocanellata, the tænia solium, and the trichocephalus dispar. The names are given in the order of frequency. In 100 consecutive autopsies on children between the ages of two and twelve years at the Hospital for Sick Children, Great Ormond Street, we found the oxyuris vermicularis in thirty-four cases and the trichocephalus dispar in eight. The first two and the last are nematodes or roundworms, and are much more common than the cestodes or tapeworms. The oxyuris vermicularis or small threadworm inhabits the colon, particularly of children. There is some difference of opinion in the present day as to the part of the colon which is the more infested. It has been generally taught that the sigmoid flexure and rectum are the favourite habitat of this worm, but from a careful examination in over 200 autopsies we have satisfied ourselves that it is far commoner in the cæcum, and in many cases is only present in the cæcum. The vermiform appendix also so often contains immature threadworms as to suggest that they may, at any rate in some cases, find a breeding-ground there.* It is a fusiform, whitish worm, the female being from a quarter to half an inch in length. The male is smaller, and usually with a curl of its more blunted tail. The eggs are oval, with the surface flattened, and usually contain a formed embryo. They are said to be introduced by the mouth and hatched in the stomach, whence they pass onwards to their habitat in the large intestine. According to Küchenmeister, one person is a sufficient host for all stages of the worm, but Leuckart considers that the ova must be discharged and taken into the stomach, there to be partially digested, and the embryo set free before the worm can come to maturity. This is not a question of much importance, for it is admitted that one and the same child can act the part of a second host by reinfecting itself—an easy matter—by means of the fingers, which are used indiscriminately for scratching the irritated outlets and conveying food to the mouth.

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* *Brit. Med. Journ.* 1899, vol. i. p. 898.

The ascaris lumbricoides, a round worm, is not at all unlike the common garden worm, but paler and more tapering. The male measures four to six inches, and is smaller than the female. The latter is ten or twelve inches in length, and is often seen, when it has been subjected to slight pressure, with a bundle of processes hanging from its ventral surface; these are the extruded ovaries. The eggs are oval, $\frac{1}{340}$ inch in length, have a nodulated shell, are produced in large numbers, and do not contain a formed embryo at the time of their discharge. With regard to the shell, Bristowe says, "they have a thick fine nodulated shell." But Cobbold makes no mention of any such nodulation—he talks of a *granular* yolk and depicts a very nodular-looking one for the ascaris mystax—although the shell itself is quite smooth.

Dr. F. Taylor writes: "They are nodulated on the surface from the presence of an albuminous substance deposited outside the shell."*

It is important to bear the characteristics of the ova in mind, because the round worm is somewhat obstinate in resisting treatment. It does not reveal its presence in the stools as a seething mass of threadworms do, and microscopic examination of the stool may be necessary to determine its presence. It inhabits the small intestine, and is seldom solitary. Any number may be found, often from two or three to five, and occasionally much larger numbers. The ova are very indestructible, they remain dormant for a long period, and in this state, or perhaps some other intermediate larval one, the worms are taken into the stomach by means of unwashed food or unfiltered water.

The trichocephalus dispar, or whipworm, is about $1\frac{3}{4}$ inches long. The tail-end is thick and rounded, the head is at the thin tapering end which forms the lash of the whip, and is often found fixed to the mucous membrane as if imbedded in it. We have always found this worm in the cæcum or ascending colon, once only in the vermiform appendix. It is hardly ever solitary, usually two or three are present—we have once found five. Its ovum is distinguished by the little knoblike eminence at each end of it.

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* "Manual of the Practice of Medicine," 4th edition, p. 620.

The tapeworms (tænia solium and tænia mediocanellata) are far less common than either the ascaris lumbricoides or the oxyuris, but they are occasionally present even in infants if they have been weaned, and in older children they are not uncommon. Inasmuch as the same treatment is efficient for both T. solium and T. mediocanellata, and the symptoms do not differ for either, it is not a matter of much practical moment to distinguish between them, but, shortly stated, the tænia mediocanellata or beef tapeworm is much more common than the tænia solium or pork tapeworm; it is thicker and tougher generally, it has a uterus which is much more finely subdivided, and the head is provided with suckers, but not with hooklets. The anterior sucker of the tænia solium is provided with hooklets. The ripe segments or proglottides are passed, and the ova distributed in this way. They are then swallowed and become the cysticercus of the next host, the cysticercus in turn becoming the mature tapeworm by passing with food, &c., into the intestinal canal of man. Tapeworms require nine or ten weeks to reach maturity, so that if after the administration of anthelmintics the worm passes minus its head, that time will probably elapse before segments again begin to appear in the fæces. Some time ago a girl of eleven years old was under treatment at the Evelina Hospital for tapeworm. The oil of male fern effected the passage of a great length of worm, but not of the head. She was directed to take no more medicine until she should again see the joints of the tapeworm, when she was to return, and on several subsequent occasions, the treatment failing to procure the expulsion of the head, she reappeared at intervals of nine to eleven weeks.

Florence C., aged eleven, came first under my care on June 18, 1878. A drachm of the oil of male fern was prescribed in the usual way with castor-oil. She reappeared on September 6, and was under treatment till the 24th; from November 29 she was under treatment till December 6; from February 14 till May 2; July 12 till September 20; on December 12 she came again, and at this her last attendance she took three drachms of the ext. filicis liquidum for a dose. In every instance the worm was detached close up to the head, but the head itself was never found.

Symptoms and Diagnosis.—All sorts of symptoms have at one time or another been ascribed to worms. They have mostly been nervous, such as convulsions, epilepsy, cramp, choreic movements, or nightmare, and have been supposed to be due to some reflex nervous discharge set going by the local irritation. But it is very doubtful whether any are of diagnostic importance. The presence of worms can only be diagnosed with certainty by finding them or their ova in the evacuations or about the anus. The habit of picking the nose is the popular indication, but it is often no indication at all. Pruritus ani is of more value, and when it is observed should always lead to a careful inspection of the fæces, and even to the use of enemata with the view to detecting the worms themselves. Other symptoms, such as irregularity of pupils, discoloration round the eyes, tumidity of the abdomen with colicky pains, diarrhœa, variability of appetite, &c., only need mention to show that they can have no special significance, although they may probably be some of the many symptoms of feeble health, impaired digestion, and irregularity of the bowels, which are often present where worms abound. The ascaris lumbricoides, however, inhabiting, as it does, the small intestine, and often in large numbers, is apt to wander into the stomach, and is sometimes associated with very acute symptoms. Sudden attacks of fever and vomiting are apt to supervene, and to assume even the aspect of a bad form of gastritis or of severe cerebral disease. I have seen several such cases which looked grave, but which ended in an attack of sickness and the expulsion of an ascaris. The round worm would seem to be particularly prone to induce convulsions. Nor need we wonder that such is the case, inhabiting the intestine, as they may do, by hundreds, and at a time of life when the nervous system has not yet reached the stable condition it assumes in healthy adult age. Dr. West has, however, seen very severe convulsions with threadworms, and other authors have equally noticed the liability to nerve disturbances which exists with the tapeworm.

Threadworms, collecting in great numbers in the rectum, are apt to excite local irritation, mucous diarrhœa, prolapsus ani, and the occasional passage of blood from the bowels. In the male they may excite priapism, and some of the symptoms of stone. Frequent micturition is a common symptom of their presence, and I have occasionally noticed hæmaturia also, and the uneasy sensations about the genital organs may induce the habit of masturbation. In the female, a purulent discharge from the vagina is by no means uncommon. Worms of any kind are liable to occasion a mucous diarrhœa, associated with a good deal of tenesmus.

Tapeworms give rise to fewer local symptoms, but they are more often associated with progressive and even marked emaciation.

The symptoms of worms are none of them pathognomonic, so that it is impossible to make a diagnosis off-hand. Supposing that a child is emaciating slowly, has a frequent cough, occasional diarrhœa, perhaps febrile attacks, and sleeps badly at night, it might equally well be suffering from commencing tuberculosis or from worms. It is indeed only by observation that the question can be settled. In all cases of doubt an aperient should be given and the evacuations carefully examined. Treatment of this kind can scarcely fail to clear up the difficulty.

Treatment.—Worms, like tinea, usually accompany a state of health which, if it cannot be called bad, is yet below a normal standard ; and, for one child in whom nothing but health can be detected, there will be many who are pale, thin, and unkempt. Possibly in the case of tapeworm the enfeeblement may in part be due to the presence of the parasite, but this can hardly be so for other forms of worm, and the existence of any kind of intestinal parasite may be considered an evidence of the need of tonic treatment and better hygiene. As a general prophylactic, salt is to be commended, and I am of opinion that this is a necessary article of diet, which is much neglected in feeding children. But general principles of this kind must be associated with special treatment directed to the death and expulsion of the worm, and this will vary for the different species.

Threadworms should be attacked locally by means of enemata. A drachm of sulphate of iron may be added to a pint of infusion of quassia, and a third part of it injected on alternate mornings. Simple salt and water (ʒij to the Oj) is recommended by some, lime-water or alum (ʒj to the Oj) by others. Enemata of this kind may be continued as long as may be necessary, and are moderately certain of success. But mothers and nurses often bungle over their administration, and either frighten the child so much that repetition of the treatment is impossible, or the fluid is allowed to run away again as soon as it is injected, when naturally enough a failure results. The lower bowel should be first emptied by an injection of warm soap and water. The child should lie upon a bed with its buttocks elevated. The enema is best administered by a Lund's inflator, the tube being passed carefully to the upper part of the rectum, and any expulsive efforts that may be excited are neutralised by the anal air-pad, which is one of the features of that instrument. In this way the fluid may be made to reach a considerable part of the colon, and the remedy is so much the more likely to be effective. The enema should be retained as long as possible. If, however, the opinion be correct that the worm resides chiefly in the cæcum, brisk purgatives, such as calomel with jalap (F. 35), must also be resorted to, as of course in that way only can a radical cure be effected, unless, indeed, intestinal irrigation, as already described, should prove to be all that its advocates claim for it. Enemata should be combined with internal treatment, and no drug is more effectual than santonine. Sulphate of iron and compound decoction of aloes (F. 36) may also be given; and iron in some form should be continued for some time after the extermination of the worms.

The irritation about the rectum is best relieved by smearing the parts with a combination of mercurial ointment and glycerinum acidi carbolici in equal proportions. Angel Money recommended an ointment of cocaine 1 part, bismuth subnitrate 2 parts, lanolin 20 parts; and santonine has been highly spoken of as a suppository for the relief of this troublesome symptom.

The round worm is best treated by santonine, which may be given in doses of one or two grains three times a day, either disguised in bread and honey, or jam. Others give a two- or three-grain dose on alternate nights for three nights, followed by a brisk purgative the morning following each dose. The santonine lozenge of the British Pharmacopœia contains a grain of the remedy, and it is a useful addition to our means of administration of the drug. After this treatment some purgative should be administered, ℥ss of castor-oil mixture (F. 4), or two grains of jalap resin in milk, being as good as any. Two or three doses usually suffice. A tonic treatment of iron is to be continued for some time after the dislodgement of the worms.

Tapeworm.—Many drugs have been proposed for the destruction of the tapeworm, pomegranate root bark, turpentine, cusso and male fern being most prominently supported. But with children, as with adults, although it is advisable to have many strings to the bow, the oil of male fern is the one remedy in almost exclusive use. It is a drug which is apparently harmless even in doses of considerable size. Half a drachm or more of the liquid extract is a proper dose for a child of six or seven. It may be given as an emulsion with ʒss of pulv. tragacanthæ co. either in milk or in any sweetened aromatic water that may be pleasant to the child. It may also be given in capsules five drops in each. The anthelmintic must be given after a fast, and with the intestine previously emptied of its contents by castor-oil. After an early tea the castor-oil should be given, and the next morning—as early as possible, so as to avoid too prolonged a fast—the male fern; the child should lie in bed, a second dose of castor-oil being given two or three hours later, or some other mild aperient, should this prove too nauseating. A breakfast of warm milk may be made at the same time, or after. Should this treatment fail, turpentine may be given—twenty drops of oil of turpentine three times a day—the food being confined to liquids. The turpentine may be given as in Formula 33, and must be followed up by a purgative every day or two. Failing these, there is cusso in ʒij doses, followed in two hours by castor-oil. Kamala is given in honey or treacle, ʒj for a dose, and naphthaline in doses of two grains twice a day (Angel Money) has also been recommended.

CHAPTER VIII.

INTUSSUSCEPTION.

Intussusception is the passing of one part of the intestine into another immediately continuous with it; the tumour so formed is called "an intussusception." In the common kind, the ileo-cæcal valve and the lower part of the ileum are received into the colon, and the tumour is composed of the colon externally (ensheathing layer), the ileo-cæcal valve and cæcum within this (returning layer), and the lower part of the ileum internally (entering layer). In this form, therefore, which is called the *ileo-cæcal* variety, the ileo-cæcal valve is always the lowest part, and supposing, as is often the case, that the intussusception passes into the rectum, it is this part which is felt by the finger within, or which protrudes from the anus. Much more rarely a piece of the ileum passes through the ileo-cæcal valve, the *ileo-colic* variety; or some other part of the large or small intestine is affected away from the valve. Further, as might be expected, the direction of the intussusception is almost invariably from above downwards; although one or two cases are on record in which the reverse direction has obtained, and a piece from below has passed into that which lies above it. Intussusception is the only form of intestinal obstruction that is at all common in children. Obstruction by a band or other cause may occur occasionally, but most cases that are supposed to be due to something of this sort turns out in the result to be peritonitis from disease of the appendix cæci or other cause.

Pathology.—It would not be difficult to occupy a good deal of space in discussing this question, but not much good would be gained thereby. I shall therefore be content with insisting upon one or two facts which seem to be all-important in their bearing upon it. And *first*, let it be noticed that by far the larger number of cases of intussusception occur in infants under two years of age—most of them under a year; *secondly*, that small intussusceptions in the length of the small intestine are by no means uncommon in the bodies of children who have died of all manner of diseases, and it is clear, from the absence of any symptoms during life, and from the absence of any local morbid appearance in the part concerned after death, that the displacements must have occurred at the time of death or but very shortly before; and *thirdly*, that the common seat of the affection which causes symptoms during life is *ileo-cæcal*.

Now, what do these facts indicate? Not much, perhaps, *primâ facie*, and yet they are very significant. Those who have been in the habit of seeing experiments performed upon the lower animals well know that at the moment of death there is not infrequently a vigorous and persistent peristaltic action of the intestine. The same thing is apparent as a clinical fact in the evacuation of the bowel which so often happens at the time of death in all varieties of disease. This is no mere relaxation of the sphincters. These become relaxed truly, but the weight of the buttocks and of the soft parts would be amply sufficient to restrain any outflow of fæcal matter, were it not that the intestine acts vigorously and persistently after death. The intestine, so to speak, has a death-struggle and dies slowly; and in so doing its muscle acts less regularly, and intussusception is an occasional consequence. It is impossible to watch a healthy infant for even a few minutes, and not see that in its every movement there is convulsion and disorder. The frequency of intestinal disorders in children is an expression of the same fact; and so also, no doubt, in large part, is the occurrence of intussusception. Intussusception is chiefly a disease of young children, because the muscular coat of the bowel is as yet too easily excited, and is prone to act irregularly and impulsively. That the ileo-cæcal valve and lower part of the ileum form the intussusception in so large a majority of the cases is also worth consideration, for the anatomical arrangement is such that it may be almost said to form a natural prolapse, or at least would readily become one upon the slightest alteration of the natural relations of the parts either as regards their relative positions or relative capacity. It has been suggested that some congenital laxity in the attachment of the cæcum is the reason of the frequency of ileo-cæcal invagination; but, granting the condition, it is not clear that it would favour the occurrence of this particular displacement, and no proof has yet been given that any such condition exists. On the other hand, the reasons already mentioned seem sufficient to explain the observed phenomena, and the more so if we allow further for the possible passage of indigestible or inspissated food. Both Eustace Smith and Donkin speak of its occurrence after a fall, and we have seen cases where it followed the tossing of an infant.

Morbid Anatomy.—On opening the bodies of children who have died of intussusception, there may be nothing abnormal to be seen at first sight. The small intestine, more or less distended, occupies the front of the abdominal cavity, and the colon is not visible. When the small intestine is displaced, probably some twisted condition of the mesentery will become apparent, and the cæcum and more or less of the colon will be found absent from their natural position. The colon will appear to take origin from a knotlike bulb of bowel, perhaps lying in the right loin or in some part of the transverse or descending colon. The small intestine passes into a node of bowel, and this, when taken between the finger and thumb, feels doughy and inelastic. The intussusception gives a livid appearance to the tumour, and there is often ecchymosis or lymph about the neck of the knot. The condition of the intussuscepted bowel will, of course, vary with the length of time that the affection has existed in an acute form. But it is generally more or less twisted or coiled from the inclusion of the mesentery; of a dark claret colour from congestion or extravasation of blood into its substance, or ash-coloured from sloughing of the surface of the mucous membrane; and the coats of the included bowel are thickened by œdema and inflammatory products. The Peyer's patches especially are often greatly engorged and swollen.

Bearing in mind that the experience of the post-mortem room is based upon cases of exceptional duration or severity, it may be worth stating what have been the effects of post-mortem attempts at reduction in such cases. Inflation has never done more than partially reduce the intussusception; hydraulic pressure applied by passing up the rectum a half-inch bore india-rubber pipe, connected with the water-tap, and then gently turning on the tap till the requisite pressure is obtained, has reduced a bad case with ease; traction upon the small intestine at the neck is not often successful; and manipulation, such as that applied to a hernia, from outside, usually reduces the greater part of the prolapse, if applied with care, but fails to accomplish the return of the last two or three inches of bowel—the part about the neck of the intussusception having by that time become tight from the squeezing and traction combined, the neck itself being then liable to split. In two or three cases I have found it impossible, by any means to effect complete reduction without doing so much local damage as would have deprived an operation of any chance of success had the child been still alive. The obstacles to reduction are chiefly two. First, the spiral twist or curve which the intussusception assumes around its mesentery, and which depends upon the inclusion of the mesentery. It is almost impossible, for this reason, to make any adequate traction upon the bowel in the proper axis. And secondly, the swelling of the coats of the invaginated bowel due to œdema, extravasation of blood, or the formation of inflammatory products—occasionally lymph—about the neck of the sac. Lymph also forms between the peritoneal surfaces of the entering and returning layers. It might be added that the glands in the angle between the ileum and the cæcum are drawn into the intussusception, and, becoming greatly congested and swollen, probably increase the difficulty of reduction in many cases. Conditions of this sort offer an obstacle to any return by direct traction, but they do not apparently during life usually offer much hindrance to reduction by other methods of manipulation, such. *e.g.*, as gentle pressure.

The experience of the post-mortem room is on the whole decidedly adverse to the chances of complete reduction when the case has existed sufficiently long to produce much œdema or inflammatory thickening of the coats of the bowel. And it may also be remarked that, supposing reduction is effected in any such case, there will still exist a more or less intense enteritis in some inches of the bowel, which must make the prognosis one of the most guarded nature for some days after.

Symptoms.—Vomiting: the extrusion of blood and blood-stained mucus per anum; the presence of an elongated doughy tumour in some part of the colic region, or the protrusion of a polypoid mass of mucous membrane from the anus; pain, and the sudden supervention of such symptoms of collapse as pallor, a sunken eye, and rapid pulse.

These, it will be noticed, are the symptoms of strangulated hernia, with the substitution of the passage of bloody mucus in intussusception for the obstinate constipation of hernia. But when we talk thus of the symptoms of intussusception, we are ignoring a very important clinical fact—viz., that the symptoms necessitate a recognition of two kinds of intussusception, strangulated and non-strangulated, or, as some would have it, acute and chronic.

An intussusception may exist without any constipation, without the passage of any blood or mucus, and indeed without any characteristic symptoms of any kind. Some years ago a child of ten months old was brought to me as an out-patient; it was cutting its teeth, was feverish, restless, and had a dry, furred, reddish tongue. The abdomen was full, but not tender—it was quite supple, and after careful examination nothing could be felt. It was not sick, and there was no passage of blood. A few days after, the mother came to say the child had died; and as it was doubtful why such a result had happened, a post-mortem was made. I rather expected, from the aspect of the tongue and the general symptoms, to find some form of enteritis; but, in addition thereto, there was an elongated intussusception of the ileum into the colon, occupying the middle of the transverse colon, of which I had no suspicion. Other similar cases are on record, and others again where cholera infantum, typhoid fever, &c., have been mistaken for intussusception. It is therefore important to remember that, unless it be *strangulated*, the intussusception may be obscured by symptoms of catarrhal enteritis. A careful examination of the abdomen for the presence of a tumour is the best safeguard against such a mistake; but even this may mislead, the small intestine becoming distended and hiding the colon.

The symptoms of strangulation of the intussusception are usually well marked. Although the child may have been ailing previously, the onset of acute symptoms is usually sudden. There is the cry of pain, obstinate vomiting, constipation, and the passage of blood or bloody mucus. And in addition to or even before these, there is the aspect of severe illness, which comes on early, and is well worth attention, as suggestive of serious mischief, when other more distinctive features are yet in abeyance. The vomiting of infancy is so common an affection that it is liable to pass without much attention; but vomiting, with restlessness and abdominal pain, and the quick onset of extreme pallor and a sinking hollow under the eyes, forms a picture that should always compel attention. Death from intussusception may ensue with no other symptoms than these within twenty-four or thirty-six hours. With regard to the presence of blood in the evacuations, it has been shown by Sir Henry Howse and the late Dr. Hilton Fagge,* that it does not necessarily mean strangulation of the intussuscepted bowel in the sense that we speak of a strangulated herina—viz., as the precursor of gangrene; for it may be present, even from the first, in cases where the symptoms run a chronic course, and where even at last no gangrene or ulceration of bowel is found. It may be concluded that it indicates some constriction of the vessels. Such a condition, is however, not incompatible with the preservation of the life of the tissues involved, particularly if the constriction is, as is probably not uncommon, intermittent. It has also been pointed out that, in many of the cases in which the bowel has sloughed away, no blood has been at any time present in the motions. The symptoms have been those, indeed, of enteritis or peritonitis, and not those supposed to be characteristic of intussusception.

The confirmation of our diagnosis is not the only advantage derived from ascertaining the presence of an abdominal tumour. It has been asserted that by observing the *behaviour* of the tumour we may also learn something of the *condition* of the invagination; that, if the tumour changes its position from time to time, we may conclude that the intussusception is not yet adherent, and therefore has not yet commenced to separate by sloughing. But it cannot be inferred that, because the tumour thus alters its position, therefore it can be reduced. The parts may not be sloughing—may not, perhaps, even be adherent—and yet may be so œdematous or inflamed as to be incapable of reduction; and in infants, in whom separation of the intussusception by sloughing offers no chance of recovery, we want to know whether, in any particular case, the intussusception is reducible, and for this any change in the position of the tumour offers no trustworthy guide.

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* "On Abdominal Section for Intussusception in an Adult," *Medico-Chir. Trans.*, vol. lix.

To sum up with regard to the symptoms. Intussusception may exist in children of some age for weeks, nay, even for months, without giving rise to any severe illness, and may be characterised only by periodical attacks of constipation, abdominal griping, and vomiting, and by the occasional passage of a little blood. Palpation of the abdomen should reveal the presence of an elongated tumour, which alters in position, in shape, and in hardness from time to time. But as commonly seen, intussusception is an acute affection of children under two years of age which runs its course in at most three or four days, and the more usual symptoms are abdominal pain and distension, vomiting, constipation, the passage of blood-stained mucus, and often the presence in the rectum of a tumour with characteristic features.

Course and Duration.—The natural tendency of every intussusception is to become nipped at its neck by the bowel which ensheathes it, and sooner or later to become inflamed and to slough off. But sometimes the nipping is long before it takes effect, and the sloughing-off process is almost never completed in infants. The spontaneous cure of an intussusception by sloughing of the invaginated mass is a result which has occurred in children of six or eight years, and in adults; but in infants under two years the disturbance set up by the inflammation of the bowel is almost invariably fatal in from thirty-six hours to three or four days—unless the displacement can be remedied by treatment.

Prognosis.—When the onset is acute, the treatment is generally unsuccessful, and the child dies; but enough cases have terminated favourably under treatment to allow of a certain amount of hope.

In cases of less urgent onset the issue is more doubtful. The risk of the ultimate supervention of strangulation must evidently be considerable; but some cases seem to right themselves under treatment, and of this the following case is probably an instance:

A boy of three and a half years was suddenly seized one evening with pain in the abdomen, which caused him to scream violently, and he was frequently sick. These symptoms continued for three days and two nights, when he got quite well. He passed no blood by the bowels. Three months later he was taken in the same way, and this time he passed a little blood from the bowels without any straining. For three weeks he vomited repeatedly, and passed frequent loose motions, but no blood. The sickness then ceased for a day or two, but, as it returned again, he was brought to the hospital. He had had a great deal of castor-oil. He lay quiet in his mother's arms, but frequently cried with abdominal pain, which came on in paroxysms. His lips and tongue were dry and furred; pulse 120. On examining the abdomen, it was not distended, but midway between the ensiform cartilage and the umbilicus there was an elongated sausage-like tumour, rather ill-defined in its outlines, but yet suspiciously like an intussusception. He was taken into the hospital under my colleague Dr. Taylor, who agreed with this diagnosis. He was put upon small doses of opium and fed carefully, when the pain subsided and the tumour slowly disappeared. He was kept under observation for six weeks, and at the end of that time no lump could be felt in any part of the abdomen, except in the region of the cæcum, and this I attributed to a fæcal collection.

I have notes of several other similar cases.

Treatment.—This will in a measure depend upon the age of the child. I will therefore take first the case of infants and afterwards that of older children. By some means or other the invaginated portion of an acute intussusception must be returned. Opium in the form of the tincture should be given in doses of one minim for a child of nine to twelve months as often as necessary, to quiet the action of the bowel. Small doses of belladonna and hydrocyanic acid may also be found useful. The abdomen should be covered with a warm fomentation or good warm poultice, and reduction must be attempted without any delay, either by manipulation, by inflation, or by the injection of water or oil, or failing these, by operation. In any case, chloroform should be administered. When the abdominal muscles are well relaxed, the tumour may be kneaded between two hands—possibly it may be fixed between the fingers and thumb of the right hand and gently squeezed. In this way an intussusception may be partially reduced, but I have not seen complete reduction accomplished thus. In one case Mr. Lane succeeded in almost completely reducing an intussusception by a bimanual method, one hand being used to manipulate the bowel externally while the forefinger of the other hand was used in the rectum. Inflation is effected by a Lund's inflator or a Higginson's syringe to which a vaginal tube is attached, and passed well into the rectum. Failing the air-pad of an inflator, the buttocks must be well compressed around the tube, and air is then pumped into the colon; an assistant at the same time gently manipulating the surface of the abdomen. The amount of force required must depend upon circumstances. Replacement of the bowel can usually only be effected by considerable distension of the whole colon, and distension of the colon sometimes requires a good deal of rather forcible pumping to compass it.

There are now on record many cases of success by this means, but on the whole I prefer distension by water to that by air, partly because I believe the pressure to act more uniformly, and partly because I have an impression that, were the distension to be followed by rupture of the bowel—and this cannot be said to be beyond the probability of occasional occurrence—the escape of water into the peritoneum would be a less risk to the patient than would the escape of air. The practice usually employed is to use an ordinary enema apparatus, and to inject as much tepid water as may be possible or necessary. Nothing appears more simple or easier to carry out efficiently than this plan, but as a matter of practice it is generally difficult to inject enough water with a force so carefully graduated as to be harmless, and yet sufficiently continuous to be successful. In many cases the greater part of the rectum is already filled by the intussusception, the water returns by the side of the tube as fast as it is injected, and thus no adequate distending force is exerted. I much prefer to connect the rectal tube with an improvised water-cistern, for in this way is obtained a more equable and forcible distension. The cistern must, of course, not be raised too high. Mr. D'Arcy Power in his Hunterian lectures recommends that the cistern should never be raised more than two and a half feet above the patient in the case of a child two years old. He also says that, in his opinion, long-continued distension under a low pressure is of more avail than rapid dilatation under high pressure. To this I would add that, were it at hand, I should now in all cases depend, in the first instance, upon a Lund's inflator, distending the bowel with warm water that had been boiled and allowed to cool down to a temperature of 100°. I have by this means reduced an intussusception that was well down into the rectum without any difficulty, the child being at the same time fully under chloroform and its buttocks elevated on pillows. Operations of this kind must, of course, be conducted with care, for inasmuch as greater force is called into play, a greater risk of rupturing the bowel is run. But then what are the alternatives? If left alone the child will probably die. If the abdomen be opened and the bowel returned, it will probably sink within a few hours of the operation; so that no risk can well be greater. It would be folly to assert that any distension of the bowel, sufficiently forcible to return any considerable length of an intussusception, is free from risk; and both inflation and the injection of water are liable to split the peritoneal covering of the intestine and may rupture the bowel completely; still, provided that the requisite distension cannot be procured without it, the aim assuredly justifies the means. Mild measures are to be attempted in the first instance, and of these I count opium, given internally; manipulation; inflation under chloroform; or the copious enema. Next in severity may be placed the more forcible distension I have described; and not till one or other of these measures has been tried and has failed should the abdomen be opened.

With regard to laparotomy, an operation of such magnitude performed upon subjects of such tender age, no matter what improvements are adopted, can never be otherwise than very dangerous. But the series of seven consecutive cases with six recoveries published by Mr. Pitts,* and the sixteen successful cases collected by Mr. Roughton† from the English journals of 1887 to 1895 promise well for surgical interference, if undertaken sufficiently early.

If, however, the operation is to be successful, it is essential that all unnecessary delay should be avoided. Where circumstances make it possible, it is best to have the surgeon at hand when first an anæsthetic is given, so that if simpler methods fail it may be possible to proceed at once with laparotomy, and so avoid the necessity for a second anæsthetic and a further delay. Early operation gives the best security against finding the intussusception irreducible, and the prolonged operation which irreducibility involves has probably had much to do with the great fatality which has hitherto attended the resort to surgical measures. The method of operation is a surgical question; I shall therefore only say that it consists in making an incision in the median line of the abdominal wall, opening the peritoneum, finding the intussusception and working it back at the neck, much as a hernia is reduced. Sometimes traction reduces it readily. Antiseptic precautions should be adopted, but great care should be exercised not to expose the surface of the child to cold. There is sometimes a tendency to neglect this precaution in the present day, though few are more absolutely essential for the well-being of the child. I am convinced that, if abdominal section is to be successful in infants, the operation must be conducted with all possible celerity, and the surface—whilst it is going on—must be uncovered as little as possible.

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* *Lancet*, 1897, vol. i. p. 1602.

† *Ibid.* 1895, vol. i. p. 573.

In older children, from three years upwards, the symptoms of intussusception are generally less urgent, and in all the cases that I happen to have seen, perhaps some half-dozen, they have disappeared more or less rapidly upon the free administration of opium and belladonna. Four or five drops of the tincture of opium and ten drops of tincture of belladonna may be given every four hours to a child of five or six years old. Should these fail, inflation or water distension must be tried, and as a last resort an operation.

CHAPTER IX.

STOMACH DISORDERS—VOMITING.

Some of the diseases of the stomach are closely allied to those of the intestines already described: acute or milk dyspepsia, gastralgia, and vomiting are so. All these being symptomatic or functional diseases, have no morbid anatomy, and for this reason are of somewhat uncertain nature. They puzzle the student, because the symptoms which to one writer indicate—let us say, for example, acute dyspepsia, to another suggest gastric fever, to another perhaps dentition fever. Gastralgia may in like manner be, for all we can positively assert to the contrary, a colic, or a nerve storm in some other part of the abdomen just as well as an affection of the stomach itself.

We shall therefore as far as possible avoid the use of terms the correctness of which we are not sure of, and describe as cases such sets of symptoms as are common in childhood, and which are attributed, both popularly and professionally, to gastric disorder.

Anorexia.—This may fitly be mentioned here not only as a symptom which accompanies various stomach disorders in infancy and childhood, but also as a condition which not infrequently stands by itself, and may be as troublesome to treat as it is obscure in its causation. Sometimes in infancy, but more often in early childhood, and about the period when the second dentition is commencing a child seems to lose its desire for food of any sort, and will go perhaps the greater part of the day without breaking its fast, and even then eat but little; or at each meal will take food readily enough but in such small quantity that the parents become alarmed. There may actually be some loss of weight but usually, if there is any, it is very slight; the child except for being of spare build, and perhaps of nervous temperament is in good health, and in spite of the small amount of food taken, remains so. It would seem indeed, in many of these cases as if for the time being the child's needs were small, and his food desires corresponded therewith.

It is difficult to lay down any precise rules for treatment of this absence of appetite; an underlying cause is to be carefully sought in every case, but in many no such cause will be found; in infants the trouble seldom lasts more than a week or two, though occasionally it lasts much longer and is extremely difficult to overcome: probably in many cases the failure of appetite depends upon some slight disturbance of digestion which may necessitate a weaker milk-mixture or perhaps partial peptonisation for a short time, or may be set right by a few doses of grey powder; where there is no suspicion of any defect of digestion, a mixture of tincture of nux vomica, ½ minim with 2 or 3 minims of acid phosp. dil, with a few drops of glycerine in water will sometimes prove effectual.

In the case of older children, the state of the bowels, the daily routine, bathing, exercise, &c., must be inquired into carefully, and sometimes especially in the case of children just beyond the age of infancy, the fault lies less in the child than in the management of the nursery, the meals may be badly prepared or badly given, with little tact and less perseverance. Plenty of fresh air, a cold or tepid bath in the morning with Tidman's sea salt dissolved in it; and massage to the limbs for five or ten minutes after the bath, may increase the appetite; and in the way of drugs dilute phosphoric acid 5–10 minims combined with 2 or 3 minims of nux vomica, or some compound tincture of cinchona (10–15 minims) with nux vomica is often effectual. The ordinary rhubarb and soda, or gentian and soda mixture given before meals is sometimes distinctly of value, as also is malt extract which apart from its nutritive value, seems to increase the appetite in some children. Small doses of liquor arsenicalis, ½-1 minim, with sodium bicarbonate may also be tried.

"Gastric Fever."—Such a term no doubt includes various conditions which may be quite distinct in their pathology, but of this so little is known that for convenience sake we may be content at present to use terms which have only a clinical significance, and that but ill-defined. Common enough are these cases of fever in infants and young children; gastric fever if you will, but that the gastric origin is uncertain; acute dyspepsia if you will, but even true dyspepsia is doubtful.

A healthy child of twelve months, with its two lower incisors cut, ailed for a day or two with feverishness, constipation and occasional vomiting. When seen first, it was fretful, with a temperature of 100·4°, and a quick pulse and full abdomen. The temperature went up to 103°, remained up for two days and a half, and then fell rapidly to normal; the tongue was thickly furred, the bowels confined, the motions light in colour, and there was occasional vomiting. The bowels were opened freely by rhubarb and soda, and acetate of ammonia was given internally. A week later one of the upper incisors was cut.

Such cases as this are very common. They occur during the progress of dentition, but have often no definite relation to the eruption of a tooth. They occur, moreover, at the time of weaning, before the stomach has become accustomed to the change in its dietary. They occur notably sometimes after errors in feeding. They will sometimes speedily relieve themselves by vomiting, so that there is some reason at any rate for considering them of gastric origin. They are somewhat erratic in course and duration. Sometimes the temperature will run up quite suddenly at night and come down again, and remain normal after the following morning, apparently in obedience to a febrifuge, but quite as likely in dependence upon what may be called the initial vitality of the fever. Sometimes the pyrexia is more prolonged, and we perhaps begin to discuss the question of enteric fever. In such cases, the idea suggested by the term *infective gastritis* may contain a germ of truth, and at any rate, in dealing with an affection of the nature of which we are quite in the dark, some fugacious erythema of the gastro-intestinal tract might be suggested as a possible cause of the elevated temperature.

In older children something of the same kind happens, the fever being associated with an acute bronchitis of the larger tubes.

Emily W. has been a frequent attendant, between the ages of two and a half years and six years, with attacks which come on quite suddenly, with vomiting, confined bowels, delirium and high fever. In one of these attacks her face was flushed, temp. 103°, pulse 160; the tongue thickly furred with white fur, red papillæ showing through; the respiration rapid, harsh all over, with copious dry râles, but no other physical signs. These symptoms are always relieved by a dose of castor-oil, and in two or three days she is quite well again.

G. W., aged five years, is another such case. He is said to be very subject to "colds," which show themselves by a temperature of 102° or 103°, a frequent cough, great drowsiness, foul tongue and breath, constipation, and the rapid development of coarse moist râles all over the chest, although often decidedly more on one side than the other. During the attack he looks seriously ill, is very restless, has a respiration of 60 or more per minute, a pulse of 140, and is constantly moaning and talking in his sleep. He has, in fact, all the aspects of a rather severe broncho-pneumonia, and to his mother is a perpetual source of scares either of whooping-cough or measles. But the threatening aspect of affairs is invariably dispelled by mild aperients; and as soon as the bowels act freely he begins to mend; the râles disappear from the chest within a few hours in a way that one would not believe to be possible did not one know it to be a fact; the cough diminishes; and sleep and his natural vivacity return to him.

In another class of cases fever and cough are combined with vomiting and purging.

A boy of three years was brought for fever and cough, which had come on quite suddenly, and after which the bowels were loose, and he was frequently sick, the attack extending over a fortnight. A little rhonchus was audible in various parts of his chest, but no other physical signs, and he rapidly improved by careful dieting and a simple citrate of potash mixture.

The **treatment** in all these cases is dietetic and aperient. In the case of infants, ʒj of castor-oil may be given at once, and, in children over two years, I must confess to a liking for small doses of calomel and Dover's powder, a sixth of a grain of each every two hours, for three or four doses, following the aperient. It may be difficult to explain the action of these drugs, but the fever seems to subside more rapidly with them than without them. Another good mixture is a combination of the tinct. camph. co., acetate of ammonia, and citrate of potash (F. 31). Another, salicylate of soda with liquor ammoniæ acetatis (F. 3).

In the gastric fevers of older children, a couple of grains of jalapin, two of calomel, or a piece of Tamar Indien, form good and easily disguised aperients. Some gentle laxative and alterative should follow, such as the granular effervescing citrate of magnesia ʒij, fluid magnesia, ʒij; ʒj of confection of sulphur three times a day; or rhubarb and soda (F. 12).

A tonic is usually necessary afterwards, and none is better than Easton's syrupus ferri et quininæ et strychninæ phosphatum; ten or fifteen drops to half a teaspoonful in water three times a day, according to age.

Vomiting in children is often, perhaps usually, functional. In some cases, however, as Dr. Soltau Fenwick has shown, there is a true gastric catarrh, and microscopic changes occur in the stomach, varying from a slight inflammatory infiltration of the mucosa and submucosa up to an advanced fibrosis almost completely destroying the mucous membrane. From the practical point of view, however, it is necessary in many cases to treat the symptoms as the disease. Vomiting is an important affection chiefly when it occurs in nurslings, and is chronic. For this reason it is advisable to treat of it according to the age of the patient, and to supplement an arrangement of this kind by adding a third group of cases in which vomiting is a reflex symptom of disease elsewhere. Thus we shall have:

(1) The vomiting of nurslings.
(2) The vomiting of older children.
(3) Reflex vomiting.

(1) Infants from the first day of their birth are subject to vomiting, not from disease, but from a perfectly physiological safety-valve action on the part of the stomach. It is impossible to adjust the ingress of food so nicely to the needs of the organ that just the proper quantity, and no more, is taken, and should there be any surplus, it is rejected. Many infants "posset" quite regularly, more or less, for the first few months of life; sometimes very soon after taking food, when gas is eructated with it; at others, later, during the progress of digestion. And, as in the muscular play of an infant's limbs we can see the physiological side of what in morbid excess becomes convulsion, so here we have a physiological action, which, if uncontrolled, may run riot in chronic vomiting.

As I have had occasion to say before, in dealing with like disorders of the intestines, in all neuro-muscular apparatus such as this, it is not so much change of structure as bad habit that needs to be combated; an abnormally sensitive nervous circuit must be broken, or in some way or other rendered less automatic in its action. It must not be forgotten, however, that occasionally there is a real organic obstruction at the pylorus, as described later on, and the recognition of these cases is of importance in view of possible surgical treatment.

All vomiting in infants must be watched. So long as it comes on early after taking food, while the quantity rejected forms but a small proportion of that taken, and the child does not suffer in any way in health, no anxiety need be felt at its continuance. Should it become increasingly frequent, or seem in any way to be in excess, it must be taken in hand, and it is generally quite amenable to treatment. If, on the other hand, it be neglected, it recurs at intervals which tend to become shorter and shorter. The vomit each time becomes more copious, till, finally, no food is retained; the vomited matters lose the well-known characters of semi-digested food; and a thin, watery, sour-smelling liquid is discharged instead. The child meanwhile gradually changes: plump and healthy, perhaps, at the outset, it loses colour, and its limbs become soft and flabby; it cries after taking food; the stomach is distended with gas, and painful on pressure, and the bowels become confined. The blood fails to be replenished owing to the persistence of the vomiting, and little by little the child becomes a juiceless, withered wasted thing, with dry, often scurfy, skin, depressed fontanelle, pinched and pegtop face. The surface is cool, the extremities cold; it is feeble, constantly whining, voracious in its thirst; the mouth and tongue red and dry, with thrush dotted about in various parts; and thus it dies starved. The immediate precursor and cause of death may be bronchitis and pneumonia, or occasionally some thrombosis of the cerebral sinuses from thickening of the blood and slowing of the cranial circulation, with its semi-comatose condition, or convulsions; but these are the natural results of the enfeebled condition brought about by the prolonged starvation.

An examination of the bodies of such infants usually shows little or no change to the naked eye. There may be an excess of mucus in the stomach, some pallor, or even some redness or ecchymosis of the mucous membrane; and microscopically, as already mentioned, inflammation of the mucosa and submucosa in all its stages has been found. The changes or absence of changes are, in fact, the same as those found in the intestine in cases of chronic diarrhœa.

Vomiting as an *acute* symptom in infants is of different significance. The chronic disease we have just described is unassociated with fever; but vomiting may be associated with fever and furred tongue, and with either constipation or diarrhœa; in such case it may mean that the child's food has disagreed with it; or that some exanthem, particularly scarlatina, is about to show itself; or that some brain mischief is brewing; or, perhaps, that some intestinal mischief, intussusception, for example, has come on.

These various possibilities must be considered and some conclusion arrived at, and this will not often be a matter of difficulty when we have mastered the differential features of the diseases of which vomiting is a sign. This can only be done under each disease as it comes before us, but it may be said in short—that the vomiting of indigestion is associated with a quick *regular* pulse and a full abdomen, and that it is very common: if diarrhœa be present also, the diagnosis is nearly certain. The vomiting which ushers in an exanthem is not a common thing in infants, but an examination of the throat and glands might help us to its elimination. The vomiting of brain disease has no definite relation to food, and is associated with an *irregular* pulse, constipation, and retraction of the abdomen; whilst for intussusception the pale collapsed appearance is perhaps the best early hint.

Treatment.—To take acute vomiting first, which from previous investigation is ascertained to be due to undigested food. If the spontaneous action of the stomach has not already done all that be needed, an emetic of ipecacuanha wine (a teaspoonful), or five grains of the powdered ipecacuanha root, should be given, and subsequently a dose of castor-oil, or a grain of calomel and a grain of rhubarb. Dr. Starr recommends equal parts of aqua cinnamomi and liq. calcis—a teaspoonful at a time, or more, for a child of ten months—as a useful and simple remedy for acute vomiting. In the very severe cases where the stomach is so irritable that it rejects even thin fluids such as whey or veal broth, or perhaps even plain water, and the infant is becoming exhausted and collapsed, there is no more effectual remedy than stomach-washing. A solution of sodium bicarbonate (gr. ij. to the ounce) should be used for the washing, and when the tube is withdrawn, an ounce of this, with ten drops of brandy may be left in the stomach. The washing may be repeated twice a day if vomiting persists. A detailed description of the method of procedure is given on p. 15. After the stomach-washing it is often advisable to give bismuth carbonate in doses of gr. v.–viii. according to the age of the infant, every three or four hours, and with this some carminative should be combined.

Subsequently a little carbonate of soda and citrate of potash may be given three or four times a day, the diet being restricted. Most of the children with whom vomiting occurs have been fed artificially, but in any case it is needful to reduce temporarily the quantity of food given. If the breast be the medium, then the child must be nursed less frequently and the quantity taken at each meal should be diminished. If other food be given, it is to be diluted and the quantity strictly regulated in the same way. Probably nothing more will be necessary, and the attack will speedily subside ; in severe attacks of vomiting and diarrhœa in infants all milk food should be stopped and the child fed on whey or thin veal broth for twenty-four hours. This has all been fully considered in earlier chapters. (Chaps. iii.–v.)

Chronic Vomiting, on the other hand, will yield to nothing else than patience. Like chronic diarrhœa, it is a most troublesome habit to eradicate, and often keeps the upper hand of all treatment. Yet in no class of cases are the results of perseverance more perceptible or more satisfactory. I have nothing to add upon the question of diet to what has already been said in previous chapters. The one common error in treatment is want of patience. A child is sick, and the food is judged, and possibly correctly so, to be unsuited to it. The food is changed, but with no better result—something else is tried, but still the sickness continues, and soon, with anything and everything that kind friends suggest, the anxious mother has run from food to food and exhausted in the process her wits, her energy, and her child.

The first thing to attend to is that there be a strong sensible nurse upon whom one can rely. There are few more discomforting or wearing things than a fretful ailing infant ; and it is of very little use to undertake the treatment of such a case as chronic vomiting or diarrhœa with a nurse who is worn-out and disheartened. It will next be advisable, in all probability, to make a clean sweep of all foods, and to start afresh on one of the simplest—we will say artificial human milk, for example.

Whatever may be selected will be met with the objection that it has been tried and has failed. But, as Dr. Graves remarks in his inimitable lectures, those cases in which everything has been tried are exactly those in which nothing has been tried; therefore, never mind, make a fresh start under the strictest limitations and directions from the medical attendant, and let not the food chosen be discarded until the doctor has satisfied himself that it is useless. Nor should this be so until some approximate idea has been obtained of the amount that the vomit bears to the food taken. The sickness is seldom arrested suddenly by any treatment, so that, if the quantity returned lessens, the food selected may be fulfilling its purpose. Having chosen a food—be it artificial human milk, digested milk, or milk and lime-water, milk and barley-water, whey and cream, or cream alone, veal broth, &c.—the next thing is to attend to the quantity given and to the method of its administration. In the worst cases all bottles must be abjured, and the child fed by syringe or spoon only. It may be that the stomach will tolerate no more than a teaspoonful at a time; never mind, as has been before remarked, a teaspoonful retained is worth more than a table-spoonful vomited; and a good deal of nourishment can be administered by teaspoonfuls given at frequent intervals. Whatever food is given should be cold. The body at the same time has to be kept as warm as possible and the child free from the effluvia of its own discharges.

In medicine nothing is better than calomel in doses of a sixth of a grain put upon the tongue every three or four hours; hydrocyanic acid and bicarbonate of soda are useful, given in combination (F. 34); we have also found cocaine useful in small doses, one-twentieth of a grain in water or more for an infant six months old: ipecacuanha wine in drop doses is recommended by some; arsenic with nux vomica and bicarbonate of soda by others (liq. arsenicalis, half a drop in a teaspoonful of water three times a day—Starr). But careful dieting is, decidedly, of more importance than any medicine, and upon it must be based our main reliance. In the worst cases, stimulants are necessary, five drops of brandy or rectified spirit being given every hour as occasion demands.

For acute and chronic dyspepsia in infants, Epstein and several other distinguished Continental observers have recently advocated washing out the stomach. The method of procedure has already been described in detail (p. 15), here it need only be said that our own experience amply confirms the recommendation of these observers, and that in any case where medicinal and dietetic treatment after fair trial has failed to arrest the vomiting, the value of stomach washing should be borne in mind.

(2) The vomiting of children past the age of immediate infancy is most commonly due to indigestion; occasionally in girls it is the precocious development of symptoms well known in young adult females as the outcome of hysteria. Sudden causeless vomiting in a child of previously good health should suggest the possibility of the onset of some acute disease, particularly of scarlatina; and, as at any other time of life, vomiting may be due to disease elsewhere.

The functional vomiting, of which alone I need speak, after what has just been said, is to be diagnosed, as it would be in adult life, by its frequency, its quick onset after food, the absence of symptoms of any definite illness, and by the nervous aspect of the patient. Children affected by it are usually from nine or ten to fourteen years.

Under the head of **Recurrent Vomiting** Dr. Gee* has drawn attention to cases which are not so very uncommon. The subjects of this condition are children beyond the age of infancy, perhaps most often between the ages of six and twelve years.

At intervals of a few months, without any apparent cause, attacks of vomiting occur, sometimes with pyrexia, sometimes without. The child is out of sorts, languid and irritable, and by these vague indications the parents can sometimes tell when an attack of vomiting is about to occur. Any attempt to take food produces vomiting; the bowels are costive.

As a rule, the vomiting lasts two or three days, and then gradually subsides, but in some cases it lasts longer; Dr. Gee mentions one in which it lasted eleven days.

In these prolonged cases the continual vomiting may produce alarming exhaustion, but more often the constitutional symptoms are slight, and the child rapidly recovers.

Such attacks may occur three or four times a year, or even more often, and the liability to them may persist for years; in one case which came under our notice the attacks had occurred at intervals for five years.

The nature of these recurrent attacks of vomiting is uncertain, but there is much to suggest a nervous element, and one might add in support of this view that this condition is most often seen in children of nervous excitable temperament. Recently it has been pointed out that during the attacks the presence of acetone in the urine can almost always be demonstrated, and sometimes there is a distinct smell of acetone in the breath. The latter has been rare in our experience, but we have found acetonuria in most of the cases which have been under our care. It is suggested that these facts point to a disturbance of metabolism, with resulting acid intoxication; but from observations made by Dr. F. S. Langmead, Medical Registrar at the Great Ormond Street Children's Hospital, it would seem that this occurrence of acetone in the urine and breath is by no means peculiar to this disorder. Acetonuria and acetone smell in the breath are found in almost any condition where a child is vomiting much, and they are also observed sometimes in pneumonia.

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* *St. Barth.'s Hosp. Rep.* 1882, vol. xviii. p. 1.

Treatment.—It might have been thought that with experience much could be done in the way of prophylaxis, and undoubtedly it is advisable to regulate the diet carefully, and to avoid excitement and over-exertion bodily and mental, in the intervals between the attacks, but such precautions will be only partially successful. On the theory that an acid intoxication underlies this disorder, treatment with alkalies in liberal doses has been recommnded by Dr. Edsall of Philadelphia, and our own experience leads us to think highly of this treatment. To a child of six or eight years, ten grains of sodium bicarbonate should be given regularly three times a day in the intervals between the attacks, and when an attack threatens a similar dose should be given every two hours for about twenty-four hours; in this way the attacks are reduced in frequency if not stopped altogether, and a threatening attack may sometimes be aborted. Intermitting courses of arsenic and bromides between the attacks are also decidedly beneficial.

When the attack has commenced, fluids in small quantities, iced or peptonised, should be given, and in the worst cases rectal feeding may be necessary. The bowels should be opened freely, and a counter-irritant may be applied over the epigastrium; but unless arrested in the earliest stage of the attacks the vomiting seems to run its own course uninfluenced by treatment, and one can only support the child's strength by stimulants and careful feeding.

3) Reflex vomiting may be due to meningitis or tumour of brain, to chronic disease of the lungs, to pertussis, to denti- n, or to worms. The vomiting of brain disease is erratic in occurrence—the tongue is clean, and there is an absence of gastro-intestinal symptoms; there is other evidence of ebral disease, such as headache, or impaired muscular power, ninished acuteness of vision, squint, and irregularity of the lse. In disease of the lung, there is the cough and emaciation; pertussis, the paroxysmal cough and bloated aspect generally fice for a diagnosis, but it occasionally happens that the sickness the only ailment of which complaint is made, the cough being gotten. Dentition and worms have already been mentioned.

Under the head of Treatment, I need only say that one is en driven to treat symptoms, and happily with a success by means inconsiderable.

Membranous Gastritis in children has in our experience ually been associated with diphtheria. The membrane in se cases is generally close to the cardiac orifice, and may be ociated with similar membrane in the lower part of the ophagus. Clinically there is sometimes much vomiting with s condition. We have also seen membrane scattered over the face of the stomach, mostly on the top of the rugæ, and companied by intense congestion of the mucous membrane in ase of severe broncho-pneumonia where there was no evidence atever of diphtheria; the condition was associated in this se with membranous colitis. It has been seen also in associa- n with tuberculosis.

Congenital Hypertrophy of the Pylorus is a rare ndition which has only recently been recognised. It is apt to mistaken for the simple chronic vomiting mentioned above, ecially as it is to some extent influenced by feeding.

The history in most cases is this: The infant is born appa- ntly healthy, and for the first few weeks takes its food well and thout vomiting, or perhaps with only slight regurgitation, ich arouses no suspicion of anything amiss. Then it begins vomit once or twice a day after food and does not seem to rive. The food is perhaps altered and there is thought to be me improvement. But the vomiting continues and gradually comes more frequent, until almost every meal is returned. he bowels are almost always costive. Careful palpation at marked symptoms and the characteristic signs of this disease, washing out the stomach twice daily and then once daily for many weeks resulted in complete recovery. If after a week or ten days of washing out the stomach twice daily, there is no gain in weight—and sooner if the weight is definitely decreasing—one or other of the surgical procedures must be adopted. In all the cases mentioned above as treated surgically, forcible dilatation of the pylorus was done, and we have seen no tendency to recurrence of the obstruction; others have advocated pyloroplasty, and others gastro-enterostomy or even pylorectomy. If surgical measures are adopted, it is well to forewarn the parents that there is often great difficulty in assimilation of food for several weeks afterwards, and although the vomiting is stopped there is still some risk of death from marasmus or diarrhœa.

Ulcer of the Stomach is not very uncommon in newborn infants, but it is decidedly rare afterwards. It occurs either as a single minute round ulcer, with a perforating tendency as in adults (*vide* Melæna neonatorum, p. 107), or as numerous small scattered erosions which stud the surface of the mucous membrane and assume the appearance of ulcerated follicles. The perforating ulcer has been ascribed to all the various causes which are held to be potent in producing the gastric ulcer of adult life, and it is probable that for children after they are weaned the pathology of the two may be the same; but for newborn infants, the circulatory disturbances which ensue somewhat suddenly at birth, the sudden arrest of the placental stream, the gradual development of the pulmonary circulation, associated as it often is with partial atelectasis, so patently predispose to venous stagnation in the abdominal viscera as to give much ground for the belief that congestion and even ecchymosis are at the root of the ulceration. The scattered ulceration has been found under such varied clinical conditions that it is impossible to attach any definite meaning to it, although one may suppose with reason that it is the result of some chronic catarrh.

Symptoms.—Vomiting of blood and melæna are the only indications which point to the existence of an ulcer of the stomach in the infant. A healthy child within a few hours of its birth who begins to vomit blood and to pass pitchy matter per anum may have a gastric ulcer. More than this we cannot say, for the same symptoms may certainly be present without any ulcer. In the few cases in which a gastric ulcer is present in older children, the symptoms, if definite, should be as in adults—epigastric pain and vomiting. The follicular ulcer cannot be diagnosed, and has always been found accidentally upon the post-mortem table.

Treatment.—The bleeding is often so quickly fatal that nothing is available; but the directions already given for cases of melæna neonatorum will equally apply here.

Tubercular Ulceration of the stomach is occasionally met with, but it has no symptoms apart from those of the tuberculous peritonitis with which it is usually associated. It occurs probably more often in infancy and in the first few years of life than in later childhood. In 206 autopsies on children with abdominal tuberculosis, at the Children's Hospital, Great Ormond Street, we met with it five times.*

Softening of the Stomach, or gastro-malacia, has been credited by some writers upon the diseases of children with being a distinct disease, but, to my mind, with insufficient reason. It has no characteristic symptoms, the appearances found after death are those of post-mortem solution, and doubtless the change is essentially what has been described as post-mortem solution. I have twice found evidence of a gastric solution of the lung which has gone on during life. I need only say that there was a distinctly peculiar broncho-pneumonia, and that in each case there had been a moribund condition associated with *vomiting* for some days before death, and, no doubt, gastric fluid had been sucked back into the bronchial tubes. Such a condition was merely the result of an ebbing life, not a disease which caused the death. So it is with the gastro-malacia of children. It is the result of exhausting disease of any kind, and is virtually, if not always actually a post-mortem change.

It is associated sometimes with similar softening at the lower end of the œsophagus; and the adjoining mediastinal connective tissue and pleuræ may show similar post-mortem digestion. It is a remarkable fact that this condition is found most often in children who have died with some intracranial disease. In 500 autopsies on children we found post-mortem softening of the lower end of the œsophagus in eight cases; seven of these were cases of tubercular meningitis; one died with a meningocele.

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* *Path. Soc. Trans.*, vol. l. p. 76.

CHAPTER X.

STOMATITIS—CANCRUM ORIS—THRUSH.

Stomatitis is a far more frequent occurrence in childhood than in later life; indeed, two of its forms, thrush and cancrum oris, are rarely met with except in children.

Five varieties of stomatitis have been described: (1) Catarrhal, (2) Aphthous, (3) Ulcerative, (4) Gangrenous or Cancrum Oris, (5) Parasitic or Thrush; and to these might be added the inflammatory and ulcerative conditions of the mouth which are occasionally seen with diphtheria and syphilis.

Catarrhal Stomatitis sometimes occurs during dentition, but is by no means a frequent accompaniment. It occurs also occasionally with specific fevers, particularly with measles, but is most often seen in association with some obvious local irritation or with thrush. The inflammatory condition is usually localised; for example, the inside of the lower lip or of the cheek may be affected and show a deeper red colour than the rest of the mucous membrane, while the surface has a finely granular appearance; in other cases the surface is quite smooth, but has a greyish-white colour, as if it had been smeared with silver nitrate. In older children there may be some complaint of smarting and discomfort in the area affected, but, as a rule, the temperature is hardly elevated, and there is little or no constitutional disturbance. When the inflammation is extensive there is often some dribbling of saliva, and the temperature may be slightly raised.

Aphthous Stomatitis the Herpetic Stomatitis of some authors, is quite the commonest variety in children. It rarely occurs under the age of twelve months, but is most frequent in children under four years of age.

The characteristic symptom of this disease is the appearance of small circular greyish patches (aphthæ) surrounded by a narrow red zone of congestion. These are seen first, as a rule, on the dorsum and edge of the tongue, near its tip, and on the inside of the lower lip; but in many cases the mucous membrane of the cheek, the palate, and the fauces also become affected.

There is much dribbling of saliva, and even before the aphthæ appear, some headache and fever, and occasionally vomiting, may be present, and the child looks pale and out of sorts. The taking of food is often difficult, owing to the pain in sucking and mastication. The temperature in a severe case sometimes reaches 102° or 103°.

The whole duration of symptoms is usually about a week or ten days.

M. W., a girl aged one year and two months, when first seen had vomited occasionally for two days, the bowels were costive, and the temperature was 103°. Two days later the child was miserable and fretful, the temperature was 99°, and on the tip of the tongue, on the hard palate, and on the anterior pillar of the fauces on the left side, there were small round patches $\frac{1}{8}$–$\frac{1}{4}$ inch in diameter with a greyish sodden appearance, and a narrow red zone at the margin. These aphthæ persisted until four days later.

E. H., a boy aged three years. The tongue was thickly coated, and numerous small circular ulcers with sharp vascular margins occupied its sides and the inner surface of the lips. The pulse and temperature remained normal.

The exact nature of these aphthæ is still open to question; according to some observers, actual vesicles are formed which burst and leave shallow ulcers; according to others, each patch consists of a proliferation of epithelium, which exfoliates, leaving an ulcerated surface. In accordance with the view that the lesions resemble the cutaneous vesicles of herpes, the condition has been attributed to a nervous origin, but the association which we have sometimes observed with a pustular eruption on the face, and the occasional simultaneous occurrence of aphthous stomatitis in several children of one family, suggests rather an infective nature.

Ulcerative Stomatitis.—Children thus affected are brought with the complaint that their breath is offensive, that they are spitting up blood, or that blood stains their pillow during sleep. It is a disease chiefly of the lower classes, and affects most often children between the ages of four and twelve years. Defective hygiene and general ill-health are powerful predisposing causes. Henoch considers that the second dentition has much to do with its occurrence; certainly the condition of the teeth is an important factor, and the child with foul and carious teeth is the one who is likely to get ulcerative stomatitis. The disease varies much in severity, of which I may give examples.

I. The common form is a superficial ulceration of the edges of the gums, the tongue, and the cheeks; the gums being vascular, and fringed with a yellow margin of necrotic granulations.

E. L., a girl aged nine, had had a sore mouth with some malaise, for a fortnight. There was superficial ulceration of the gums, mostly in the lower jaw, running along the line of junction of the gum with the teeth. From this there was an offensive sanious discharge. A few circular pustular-looking ulcers were present on the mucous membrane of the cheek and some on the sides, tip, and dorsum of the tongue.

In young children this condition may be accompanied with considerable elevation of temperature (102°–103°), and I have sometimes thought, from the correspondence of the lysis with the commencement of a rapid healing of the ulcers and the disappearance of the fur from the tongue, that possibly some cases at any rate might be due to a specific germ.

II. Large, more or less deep, sloughing ulceration of the cheek, but not accompanied with much lividity, or surrounding induration.

S. A., a girl aged six, had been out of sorts for a month. The bowels were confined; she had cough and colicky pains in the abdomen. A large unhealthy-looking grey slough occupied the greater part of the inner surface of the right cheek. The gums were ulcerated all round the mouth, and many of the teeth were loose. The tongue was superficially ulcerated.

Ulcers of this kind are generally of very irregular surface owing to their size, the superficial swelling, and the pressure of the teeth against them. For the same reasons they cause a good deal of pain to the child in eating, the swollen surface getting between the teeth. They may in this way retard recovery by rendering the child unwilling to take a proper quantity of food.

They are usually as amenable to treatment as other kinds, but the teeth are liable to become loose; occasionally a small piece of bone from the alveolus may exfoliate. But a case of this kind once occurred to me where the process was so severe that a large part of the lower jaw necrosed, all the teeth came out, and the child (aged two) died, exhausted by high fever. I believe this case was of scorbutic origin. I have once seen, too, cancrum oris follow what I considered at the outset to be this form of ulceration. The child came at first as an out-patient to the Evelina Hospital, and was admitted to Guy's Hospital a day or two later with cancrum. West mentions the possibility of such an occurrence, but considers it one of rarity. Dr. J. F. Payne has noticed that ulcerative stomatitis is sometimes accompanied by a pustular eruption on the lips and hands, and he thinks, as is not improbable, that the same virus accounts for the disease in the different parts.

Treatment.—For catarrhal and aphthous stomatitis some simple mouth-wash should be used, such as a mixture of borax with potassium chlorate, or a 5 per cent. solution of sodium benzoate, or listerine half a drachm in an ounce of water. For infants the glycerinum or mel boracis gently smeared over the mucous membrane with a clean finger makes a suitable application. Potassium chlorate should be given internally in doses of three grains three or four times a day for a child two years old.

Ulcerative stomatitis often requires more active treatment. When the ulceration is extensive and deep upon the cheek, the mere size of the ulcer requires time for its closure; and a corresponding ulcer on the tongue, which is not infrequently present, and probably due to direct inoculation, may prove a little troublesome. But, as a rule, the exhibition of chlorate of potash is followed by cure within a few days. The subjects of stomatitis are usually somewhat out of sorts; so soon, therefore, as the mouth will bear it, the chlorate of potash may advantageously be combined with a tonic of hydrochloric acid and tincture of cinchona, or some iron and mineral acid may be given instead (F. 18, 30).

When the ulceration is considerable, the ulcerated surfaces should be freely swabbed by the medical attendant with a saturated solution of permanganate of potash. Two applications of this kind, at intervals of two or three days, are generally sufficient: but, if practicable and necessary, such an application might be made daily, and a gargle of the ordinary Condy's fluid, half a teaspoonful to a pint—or a teaspoonful of the Pharmacopœial lotion—should be used frequently, either by syringe or gargle, as the age of the child may require. Many other preparations are also in use; a saturated solution of boric acid in glycerine is a good one, so also is the glycerinum boracis. Dr. Donkin* speaks highly of salol, a drachm in an ounce of glycerine, painted over the parts with a brush. Loose teeth should not be extracted until a chance has been afforded them of refixing themselves in their sockets, or until it is evident that their presence is prejudicial to the healing of the sores.

Cancrum Oris, Noma, or **Gangrenous Stomatitis** is characterised by the appearance of an indurated swelling in the gum or cheek, which rapidly extends and mortifies, perforating the soft parts, and, if unchecked, destroying all the tissues within its reach. In this way a circular eschar is produced, in which the entire cheek may disappear; the ulceration extends into the orbit or on to the neck, the underlying bone being killed and the teeth dropping out. The disease commences on the gum (Sanné), or on the inner surface of the cheek, as a livid red, painful induration, which soon extends through its entire thickness, and appears externally, the skin becoming red, tense and shining. The area of redness gradually extends, the parts around become œdematous and the central part gangrenous. An irregular ulcer is now seen in the centre of the affected mucous membrane, covered with a grey or yellowish-grey slough, which, by means of lateral and deep extension, rapidly kills all the soft parts, and ultimately produces a circular perforation in the cheek. The disease often appears to undergo a temporary arrest, but only to begin again shortly in the edges of the ulcer. The indurated swelling makes the opening of the mouth a difficulty, and there is copious dribbling of fœtid saliva. The gangrenous aspect of the sore, the blackened teeth showing the sloughing gums beneath, and the excessive fœtor, conspire to make a picture so repulsive that even the death of the child—which hitherto has resulted in over 75 per cent. of the cases—adds but little to its intensity, and comes in most cases as a welcome relief. After the formation of the slough there would appear to be but little pain attending it; the child is usually prostrate and lethargic.

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* "Diseases of Childhood," 1st edition, p. 25.

Noma pudendi would appear to be a similar affection of the external genitals, and the description just given as affecting the mouth will apply, *mutatis mutandis*, to the disease elsewhere.

Morbid Anatomy.—But little can be added to the clinical history. A black-edged, foul-smelling ulcer extends over more or less of one cheek. Its base is formed by what remains of the gangrenous tissue of the cheek, by remnants of gum tissue, necrotic jaw, and discoloured and even ulcerated tongue. The soft parts being so extensively involved in the sloughing process, and having, in addition, usually received a copious dressing of some strong escharotic, are not in a state favourable to any minute examination; but, so far as I have seen, there is comparatively little accessory œdema of the parts surrounding the disease after death; nor need there be any formation of purulent thrombi in the facial or other veins of the neck; but abscesses in the lungs and pyæmia from this source are occurrences which are not infrequent, and should be remembered and searched for. Rilliet and Barthez describe the neighbouring lymphatic glands as enlarged. The swelling is not usually great, but there may be considerable injection. I should be inclined, indeed, to make a contrast between the morbid appearances of facial carbuncle and those of the disease we are discussing, in this way, that the former is associated with much serous infiltration and tendency to purulent thrombosis, the latter not. In most cases there is a diffused form of broncho-pneumonia about the root and bases of the lungs, and death is caused by a lesion of this kind, or by the drowsiness and exhaustion to which allusion has been made.

Etiology.—The most important fact which has been observed under this head is that, in so large a proportion of cases, measles (110 times in 226 cases—Sanné) has preceded it. Scarlatina, typhoid fever, diphtheria, pneumonia, unwholesome living of all kinds, share—but to a less extent—the bad name which attaches to measles; and German authors insist also upon the frequency of its occurrence after the administration of mercurials. West records one such case out of ten; but this event is probably not a frequent one in England.

The constitutional symptoms are not always alike. Occurring as it does so often in anæmic and exhausted children, after measles and such like, malaise and fever (101° to 104°), though usually present, may be overlooked; and the dribbling of fœtid saliva and the livid induration of the cheek are the first signs to attract attention, the child soon after becoming prostrate and drowsy. But it occasionally happens that the gangrene may progress even to the destruction of the greater part of the cheek, the child all the while sitting up and playing with its toys; and in such case the fatal result may be due to the poisonous exhalations, to a diphtheritic-like asthenia—perhaps to the putrid saliva which it swallows. In a minority of cases the sloughing stops, or is arrested by treatment; the edges of the ulcer granulate, and the child recovers. It is worthy of note that when this happens the gaping aperture contracts to very small dimensions; but the perfection of the cure is somewhat marred by the frequent occurrence of corresponding distortion of the angle of the mouth or lower eyelid—or, by the inconvenience caused by adhesion of the cheek to the gum or bones.

The disease is most common in spring and autumn; it may occur at any age between two and twelve years, but chiefly from two to five; and more often* in girls than in boys.

Treatment.—The great fatality attaching to cancrum oris must not lead us to a desponding neglect of its treatment; on the contrary, there are certain cardinal aims to be sought, which, though difficult of achievement, are not, let us hope, impossible or impracticable, and which, if they can be attained, may lessen the mortality. It has been held by most writers up to the present time that the disease is a constitutional blood condition, not a local one, and the evidence of this has been sought and found in its occurrence after the exanthemata and in the broncho-pneumonia or occasional pyæmia which ushers in death. But conditions of exhaustion are just those in which nowadays risks of local contagion are considered paramount. It could be shown, as the outcome of numerous autopsies, that severe operations about the mouth—such as removal of the tongue and gangrenous ulcers about the throat, &c.—are particularly prone to be followed by a gangrenous form of broncho-pneumonia; and it is only too obvious that in these, as in the case of cancrum oris, there is every probability that septic matter is carried along the respiratory passages. Lastly, the occurrence of abscesses in the lungs, if not explicable in this way, is intelligible as resulting from transmission of septic matter along the branches of the external jugular vein to the right side of the heart and the lung.

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* Vogel, "Lehrbuch der Kinderkrankheiten," 1880, p. 90; Barthez and Sanné, vol. ii. 1887, p. 236.

Thus, then, the prominent features of cancrum oris admit of interpretation by means of some virulent poison. But let me draw attention to another point in its history, which is, I think, suggestive also in this respect. I have alluded to it in recording the fact that the gangrene of the face may produce very extensive destruction whilst yet the child is at play with its toys, eats and drinks well, and appears but little affected. In this respect these cases bear a resemblance to some of charbon, and to some also of diphtheria. Like these, also, it is a disease in which micro-organisms have been found in the blood,* although at present in but a small number of cases; and from anthrax some encouragement is derived to persevere in local treatment, for my surgical colleagues at Guy's Hospital have found that in that affection early and vigorous local treatment offers a fair chance of cure. I need only add that all writers have hitherto continued to recommend local treatment, although it has not been attended with any remarkable success.

But, as regards success, a disease so desperate requires correspondingly stringent remedies, and, between the one and the other, it is not to be wondered at that a delicate child often succumbs. Nevertheless, such success as is possible can only be obtained by constant attention to two points: (1) The destruction of the local virus; (2) The prevention of the passage of fœtid matter into the respiratory passages.

Upon the first head I have nothing new to say. I can only repeat that in anthrax, which has many features of similarity, the disease has been treated early by free excision and subsequent cauterisation, and, in several instances, with success, and I should strongly recommend a similar procedure for cancrum oris,

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* "On a Case of Noma in which Moving Bodies were observed in the Blood during Life," by A. E. Sansom, M.D., *Medico-Chir. Trans.*, 1878, vol. lxi. p. 1. See also Klein, "On Micro-organisms in Disease," p. 92, for some observations of Mr. Lingard on the presence of bacilli in the diseased parts.

[illegible] as already [illegible] to be [illegible] removed, and [illegible]

[illegible] by [illegible] removed [illegible]

[illegible] stomach [illegible] Should [illegible] I am not sure that it [illegible] and thus allow of [illegible] contagion [illegible] as it appears to be. [illegible] Dr. West from his [illegible] MM. Rilliet and Barthez [illegible] less [illegible] broncho-pneumonia. It [illegible] MM. Barthez and Sanné give [illegible] that the broncho-pneumonia is often the [illegible]

[illegible] the child's strength must be [illegible] nourishing liquids and stimulants. [illegible] any difficulty in introducing them by the mouth, they may be given by a tube or catheter passed [illegible] or along the floor of the nose. As a last [illegible] nutrient suppositories may be used, the [illegible] artificially digested beforehand. Chlorate [illegible] should be administered if possible.

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* *Lancet*, vol. i. 1859, p. 580.

Thrush is a fungus which grows upon the buccal mucous membrane, and occasionally extends to other parts of the digestive tract, such as the œsophagus, the stomach and intestines. The oïdium albicans is the name by which it has long been known. It was formerly thought to be one of the widespread moulds, but is now considered to belong to the yeast group, and to be identical with the organism of sour milk, the oïdium lactis. It consists of long-jointed threads and spores, which, like tinea upon the skin, are sometimes entangled in the epithelium only, and sometimes run down into the follicles. Like tinea, it appears to be contagious. Its frequent presence in the mouth is thought to be favoured by the acid reaction which so often obtains there. It is generally held to be a form of stomatitis, but it is not necessarily so. To many cases of stomatitis thrush is superadded. The thrush fungus may, no doubt, itself be a cause of stomatitis, but it may and does exist without any appreciable inflammation whatever. Tinea of the scalp may exist without exciting any inflammation, and thrush likewise. It is thus that two groups of cases are met with in practice—those in which there is no inflammation, when the disease is readily curable; and those in which there is more or less inflammation, and where it is dangerous either in itself or as indicating a widespread disorder of the digestive tract associated with feeble energy.

In the first group the affection is prone to attack infants within the first month of birth—the small and spare ones of infancy, who take to the breast badly or are being fed artificially. Looking into the mouth, a layer of thin white membrane is seen covering the arch of the palate; perhaps a little similar material is dotted in opaque white specks over the sides of the tongue—the mucous membrane around being quite pale and free from inflammatory action. Under the microscope the white layer is found to be composed of oil-globules from the milk, squamous epithelium, and the spores and mycelium of the fungus. A better-adapted diet—often in the direction of a little added cream—and the frequent application of the glycerinum boracis to the affected parts, will cure the disease. The mouth should be carefully wiped out after each meal with a moistened soft rag or a swab of well-wetted wool and the glycerinum boracis applied afterwards, either on a piece of soft rag or gently smeared over the mucous membrane with a clean finger. Cases are on record in which the contagion appears to have been conveyed from one child to another by means of spoons, bottle-nipples, and such like, and the possibility of such a thing should enjoin the most scrupulous cleanliness.

In the graver cases embraced by the second group, dryness and injection of the mouth are superadded; the papillæ of the tongue are prominent and vascular, and the fungus occupies a larger area and is of more luxuriant development. The dorsum of the tongue will be more or less covered, and the lips, cheeks and edges of the tongue are also affected with milky-white points of the growth. Superficial ulceration is also often present.

In all cases of thrush, but in these bad cases more especially, there is a liability to an erythematous rash, or even a superficial dermatitis, about the buttocks and genitals. Mothers are fond of telling that their children have had the thrush, and that "it has gone through them"—a popular expression which, although not wholly true (for it is but rarely that the fungus is present about the anus, or even in the intestines), is not altogether erroneous.

What actually happens is probably this: the presence of thrush indicates a disordered state of the secretions of the mouth. The state of the tongue and faucial mucous membrane is to some extent an indication of disorder all along the gastro-intestinal tract with which erythema, intertrigo, eczema, or superficial dermatitis, by whatever name the disease may be known, is associated. This is supposed to be due to acrid discharges from the bowels and to abnormally irritating qualities of the urine. But I am disposed to think, from the nicety and rapidity with which its recurrence can in some children be controlled by the regulation of the starchy matters in the food, that it is in all probability due to a general blood condition, which shows itself in those parts where local conditions—such as warmth, moisture, and irritation—favour it.

There may be some fever with this form of the disease

Severe thrush is a common sequela of chronic diarrhœa or vomiting, prolonged starvation, and pyrexia of all kinds—particularly when associated with dentition and gastro-enteritis. It may also present itself after any severe illness, such as any of the exanthemata may produce. This form of the complaint denotes extreme exhaustion, and the general condition rather than the local state calls for treatment. It is, moreover, a case rather for dieting than for drugging. The details must be suited to the special circumstances, and the body-heat must be kept up by all possible means. The food must be nutritious, and given frequently in small quantities. Stimulants, such as brandy or rectified spirit, in twenty-drop doses every three or four hours, are generally most beneficial. No care is too exhaustive for such cases. The directions for food, stimulants, drugs, &c., should all be written precisely on paper, and frequent visits may be necessary to ensure that they are intelligently carried out.

In addition, small doses of carbonate of ammonia or of chlorate of potash should be given (F. 30) every three or four hours, and the glycerinum boracis be applied frequently, as before described.

Ulceration of the mouth is met with under other circumstances besides those which have already been mentioned, and here we may allude to the so-called **Bednar's Aphthæ,** a symmetrical ulceration of the mucous membrane on the hard palate, which is occasionally seen in infants during the first two or three months of life. An oval and usually shallow ulcer is seen on each side of the palate near the alveolar margin, and close to the posterior limit of the hard palate.

The origin of these ulcers is uncertain: Henoch emphasises the fact that they are not syphilitic, and suggests that, owing to the special thinness of the mucosa here, friction of a rubber teat, or possibly of the finger in cleansing the mouth, may start the ulceration.

Any such exciting cause must be removed, and the glycerine of borax should be applied; in most cases the ulcers heal rapidly, but in feeble and marasmic infants they occasionally extend both in depth and area, and may require the application of silver nitrate (1 in 15) with a camel's-hair brush.

Syphilitic Ulceration requires special mention, although it is by no means frequent. Syphilis in children may be either congenital or acquired. Acquired syphilis is rare, but when it occurs it may be associated, as in the adult, with considerable soreness and superficial ulceration of the tongue, and with mucous tubercles about the angle of the mouth.

Here is such a case:—A boy, aged six, who had never had any previous illness, had complained of pains in his limbs for a fortnight. He had enlarged cervical glands, a macular syphilide all over the trunk, and injection of the fauces with ulceration of the left side of the uvula. There were condylomata about the scrotum and anus. His mother had had an ulcerated throat; but no other source for the inoculation could be traced; nor was there any evidence of any chancre. He was treated with grey powder, the condylomata being dusted with calomel, and he rapidly improved, save that, temporarily, he lost a good deal of his hair.

Congenital syphilis in its later phases is apt to show itself by intractable ulcers about the tongue, mouth, or palate.

Thus, a boy, aged four, who had snuffles badly when a child, was brought for a serpiginous ulcer on the dorsum of the tongue, the centre of which was raised and warty. The ulcer slowly healed under iodide of potassium and iodide of iron. He was also suffering from syphilitic choroiditis and retinitis pigmentosa. In another boy a large ulcer destroyed the frænum linguæ, and covered part of the floor of the mouth.

Another case, a girl, aged twelve, with depressed nose, thick alæ nasi, fissured lips, and pegged teeth, had a deep perforating ulcer of the hard palate, and ulceration of the right pillars of the fauces.

Sometimes, as in adults, the whole of the soft palate is destroyed, the parts become cicatrised, and the thickening extends to the fauces and larynx.

Treatment.—All such cases, whether due to acquired or congenital syphilis, should be treated by mercurials. A grain or two grains of the hyd. c. cret. may be given once or twice a day, or mercurial inunction may be employed if the child is quite young. For children out of babyhood the liq. hydrarg. perchlor. is a convenient remedy. In the late ulcer of congenital syphilis, a grain of iodide of potassium with iodide of iron may be given as well, and occasional applications of nitrate of silver may also be necessary.

Ulceration at the Angles of the Mouth is by no means always syphilitic. It is very common in young children with chronic wasting disease, or indeed with any severe disease, to see unhealthy-looking sores at the angle of the mouth. The skin here has a white sodden appearance very like a condyloma;

then it becomes cracked, and superficial ulceration occurs, a condition to which French writers have given the name of *Perlèche*. In most cases the trouble goes no farther, but sometimes deep ulceration occurs and the condition is very intractable.

A somewhat similar condition, found especially in poorly nourished, pale, miserable children, is fissure of the lip. A small crack appears, usually in the lower lip, at first quite superficial, then extending more deeply. The whole lip becomes swollen, and the fissure takes on a dry unhealthy appearance, with no attempt at healing. Such cases are often very troublesome to treat. The first essential is to prevent the child from picking at the lips and mouth. This is best done by bandaging a piece of cardboard round the arm so as to fix the elbow-joint in extension, a simple method which has the advantage of inflicting the minimum of restraint on the child. For the sores at the angle of the mouth, a simple ointment, zinc or boracic, may be tried, but in some cases it may even be necessary to touch them with pure carbolic acid. Fissure of the lip is best treated by strapping, as in the treatment of hare-lip, so as to keep the edges at rest and in contact, and for application, lanolin may be used.

Ulceration of the Frænum Linguæ in Whooping-cough.—This is a very frequent occurrence in the convulsive stage of pertussis, and a good deal of attention has been directed to it of late years. In some statistics collected at the Children's Hospital, Great Ormond Street, this ulceration was noted in 28 per cent. of the cases of whooping-cough (Voelcker). It is usually a shallow, sharp-edged ulcer, situated on the frænum, or on the under surface of the tongue on each side of the frænum, and it often has a yellowish surface. It appears to be in some way associated with the presence of the two lower central incisor teeth, as it is never found unless they have been cut. It is therefore most probably due to the fretting of the tongue upon their edges when the cough is severe or frequent. It is said by Vogel to be most frequent between the ages of one and two years, and that it but seldom occurs in older children.

The ulcer heals spontaneously after a time, and does not usually require treatment.

Hypertrophy of the Tongue (macro-glossia) occurs occasionally. It is congenital, and is usually associated with imbecility and other evidences of abnormal development, either excessive or stunted. The enlargement is due to dilatation of lymph spaces and increase of connective tissue, and is therefore not a true hypertrophy. When extreme, it causes early death by suffocation. But to a moderate degree it need not interfere with either respiration or deglutition, and children of one or two years old may be seen with a fleshy mass visible between the teeth of the half-open mouth which characterises this hideous deformity.

Geographical Tongue, wandering rash, annulus migrans, ringworm of the tongue; by one or other of these names a curious condition of the tongue is described which is often seen in children. On the dorsum of the tongue there are slightly elevated whitish rings or crescentic lines suggesting heaped-up epithelium bordering an area which appears unusually pink, as if denuded of its superficial epithelium. The rest of the surface shows nothing abnormal, or at most slight furring. The rings disappear from one part as they spread to another, hence the name "wandering rash." We have seldom seen it produce local symptoms, but in some cases itching or smarting has occurred.

The pathology is unknown. The condition is, perhaps, most often seen with gastro-intestinal troubles, but these may be merely a predisposing cause. We have sometimes thought that children of excitable temperament were more prone to it than those of phlegmatic habit. The appearance certainly suggests a parasitic origin, but none has been proved: in one case, at the Hospital for Sick Children, Great Ormond Street, several children in one family were affected.

Hare-lip and **Cleft-palate** also require mention, because in infant life they interfere seriously with sucking. A special india-rubber nipple is now made with an obturator, as it is called, or flat piece of india-rubber, above it. This contrivance, though rather clumsy, when put into the mouth, fills up the cleft in the palate, and allows suction to be carried on, and by this means many infants can be reared. Sometimes artificial feeding can be successfully effected by means of a glass syringe, or by carefully regulating the flow of milk through a syphon of india-rubber tubing; sometimes slow and laborious spoon-feeding alone answers; and sometimes nothing succeeds, and the child starves. These are cases which often require the expenditure of considerable ingenuity and thought to combat the many incidental peculiarities which occur. In hare-lip, an operation should be immediately resorted to if the difficulty in taking food cannot be otherwise overcome. In cleft-palate operative measures have hitherto been deferred until the third year or after, although in special cases they may be undertaken with success at much earlier ages.

CHAPTER XI.

DISEASES OF THE TONSILS AND PHARYNX.

Sore Throat (Pharyngitis) is a very common ailment in childhood, and perhaps, as Haig-Brown writes,* there is none "about which masters and matrons know less, or think they know more." The difficulties lie in the fact that this region, rich in blood and nervous supply, is "hail fellow well met" with all sorts of diseases, and it is not easy to distinguish the special rubicundity which attaches to each. To be honest, it cannot be done, at any rate by words, though I will not say that there are not more subtle criteria learnt from experience which do enable, each for himself, after a time, to act, if not always without hesitation. I allude now more particularly to a general redness of the throat, which may be associated sometimes with measles, sometimes with typhoid fever, with septic poisons of various kinds, scarlatina, pneumonia, rheumatism, catarrh, &c. Some of these are contagious, some are not; and thus it happens that the wise rule to proceed upon in any case is to assume that it is so, until by careful observation one is at liberty to conclude otherwise. With the inflammations of the tonsils it is allowable to be a little more precise.

Acute Tonsillitis is not a common disease of children, if quinsy in adults be taken as the standard of comparison. A girl of six, however, came under my treatment for a large and very deep punched-out ulcer on the left tonsil, which could, I think, only have originated in an acute suppuration of the tonsil, and a consequent slough of its anterior part. It was so deep that, afraid of hæmorrhage, I admitted her. It speedily healed under tonic treatment and the local application of boric acid and glycerine. But a less acute form of disease is very frequent, where the child complains of headache, refuses its food, perhaps has a little pain in swallowing, and the temperature rises quickly to 100° or 102°. Henoch notes the occasional occurrence of convulsions, but this must be very rare. The tongue is furred and often red at its edges. The tonsils are swollen, the whole of the fauces are brightly injected, and, perhaps one begins to think of scarlatina. But no rash is visible nor is there much enlargement of the glands, and probably the case is left as one of doubt, with the prescription of a gentle purgative of some sort, and the enjoinder of warmth and a light diet for the next few hours. Soon the bowels act, the temperature falls, and within a day or two the child is well again—with, maybe, a little undue pallor and want of its accustomed energy. Some children are peculiar in exhibiting a tendency to the recurrence of bronchitis or pneumonia, but cast it off as they grow older. And of late years it has been noticed that an attack of this kind sometimes precedes rheumatism, and possibly it may be substituted for acute rheumatism in one member or another of neurotic families.

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* "On Tonsillitis in Adolescents." Baillière, Tindall & Cox, 1886. A pamphlet embodying the result of much careful observation.

In another set of cases the tonsils are more exclusively involved, they are red and swollen, and upon one or both are numerous yellowish-white spots of inspissated secretion from the follicles. Sometimes these spots coalesce to form a more or less definite layer which puts on some of the appearances of the membrane of diphtheria. This form of disease, perhaps even more than the former, is associated with mild symptoms ; and the swelling of the tonsils with exuding secretion may often be met with as a temporary occurrence, with hardly any appreciable alteration in the child's health, when the tonsils are the subject of chronic hypertrophy. Acute ulceration of the tonsils is not uncommon in children as the result of bad hygienic conditions and exposure to sewer-gas, and ulcers from this cause may be either superficial or deep. No age is exempt from this risk. If children in a house are frequently suffering from sore throat, the drainage and the various pipes in the lavatories, baths, and sinks must be systematically examined. If a child is suddenly noticed to have enlarged glands at the angle of the jaw in front of the sterno-mastoid, never be content without a thorough examination of the tonsils. Ulcers in young children are often difficult to see, and elude observation in consequence.

The chief interest and importance of any acute angina in childhood rests upon the fact that we have at once to balance the possibilities of its origin—to decide, if possible, whether it be simple, scarlatinal, or diphtheritic. It is easy to state in general terms the distinctions between simple follicular tonsillitis and diphtheria; that the membrane of the one is non-adherent and yellowish, in the other grey and adherent, leaving a bleeding surface behind it when detached; that in one there is but little enlargement of glands, in the other much; in diphtheria albuminuria, in follicular tonsillitis none; in the one much constitutional depression, in the other but little. But such criteria are not sufficient for practice. Tonsillitis may assume a severe form, as in the following case, and we are at once in doubt whether it is not diphtheritic or scarlatinal. A boy, aged six, was admitted into Guy's Hospital for stone in the bladder. A day or two before he was to have been operated upon he became feverish, then very ill, and he died. At the inspection, both tonsils were found to be swollen and boggy from diffuse suppuration.

On the other hand, diphtheria may be exceedingly mild, the membrane but little or out of sight, the constitutional disturbance actually none, and the practitioner flinches from pronouncing an opinion, with all that it involves. Moreover, I have again and again seen—and who has not?—a prevalent tonsillitis of no specific character, but which has been here and there associated with marked diphtheria, or followed by diphtheritic paralysis. Therefore, let me say again, no ailments more require a calm circumspect judgment than sore throat and tonsillitis. Every possible evidence must be weighed—not only that derived from such observations as have been suggested, but also that drawn from the general surroundings of the patient. This will involve inquiries concerning the child's playmates, its school, the house in which it lives, the health of all with whom it in any way has come in contact, the health of the neighbourhood, the drainage, the rainfall, perhaps even the direction of the wind. But in addition to careful observation of this kind there is now open to us a means of positive distinction—viz., the power of ready cultivation of the diphtheria bacillus when the disease is of that nature (see pp. 236, 238). If this information be not accessible, then—having exhausted as far as can be the sources of evidence—one of three courses is open to us: to call the case diphtheritic or scarlatinal, to call it simple angina, or to say the nature of the disease is uncertain. It is much better to confess to some uncertainty than to make light of a complaint which, perhaps, is subsequently proved to be of scarlatinal or diphtheritic nature. I may add here that Haig-Brown * gives evidence to show that follicular tonsillitis is sometimes possessed of contagious properties.

If one distinction must be singled out as less likely to mislead us in any disputed case, no doubt it is that of the behaviour of the membranous formation about the tonsils or fauces. In simple follicular tonsillitis the pseudo-membrane is non-adherent—is easily detached or pressed out—and the surface beneath is intact. In diphtheria the membrane is adherent, the surface beneath raw and often bleeding, and this even for cases where the constitutional symptoms are almost none. But we may hope ere long to have more precise means of distinguishing the several forms of infective pharyngitis by following up the research initiated with so much promise by Drs. Washbourn and Goodall, and cultivating the organisms that are characteristic of each.

Treatment.—In view of the probable contagious character of some cases of acute tonsillitis, it is wise, if possible, to keep the child isolated during the acute stage of the affection: the child will probably be ready enough to stay in bed, if the accompanying feeling of malaise is considerable as it often is, and indeed it is well the child should be kept in bed during the pyrexial period. At the outset it is advisable to give a dose of calomel sufficient to produce a free action of the bowels; and whilst headache and malaise are prominent symptoms a dose or two of phenazone or phenacetin, 1–3 grains of either, according to the age of the child, may give considerable relief. Local applications which are seldom necessary, except in severe cases, should be given with a spray; and perhaps as useful as any is the solution of perchloride of mercury, which may be used in the strength of 1 in 3000, or if the child is old enough to be trusted to spit it out instead of swallowing it, 1 in 1000 may be used. Potassium chlorate may be used either as a spray, fifteen grains mixed with ten minims of dilute hydrochloric acid and half a drachm of glycerine in an ounce of water, or it may be given internally in doses of three to five grains every four hours according to the age of the child. For older children the potassium chlorate lozenges of the B.P. or the pastils of borax and potassium chlorate which are made by various firms of chemists are useful. Very grateful to children who are old enough to suck it slowly, is ice in small pieces. The food must perforce be chiefly fluid whilst the throat is at its worst. Milk, egg beaten up in milk, beef tea, beef jelly, Bovinine, Brand's Essence, thin boiled custard, all of these in turn may be useful, but as soon as the temperature has fallen and the child is able to swallow comfortably, a liberal diet of whatever nourishing food the child will take should be allowed; and at this stage tonics, especially nux vomica in some form, are required.

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* *Op. cit.*, *vide* footnote, p. 164.

Chronic Tonsillitis and Hypertrophy of the Tonsils are almost sufficiently described by their nomenclature. The tonsils are seen to bulge into the fauces, either pushing the pillars forwards or emerging half pedunculated between them as pale red bodies, with a trabeculated and pitted surface, often studded with a yellow secretion which exudes from the mouths of the follicles. It is an affection which comes on insidiously. When it has made some progress, the throat is liable to recurrent attacks of a mild form of inflammation or catarrh; it is but seldom that the increase in size dates definitely from an acute attack. There is a good old pathological axiom that for one chronic disease that follows an acute one there are many which take an opposite course, and this is a good illustration of that rule; at the same time I do not deny the occasional origin of chronic enlargement in repeated attacks of pharyngeal catarrh. Nor is this a condition which is certainly strumous. That the tonsils do occasionally become the seat of a tubercular process, and may in some cases be the primary focus of a generalised tuberculosis one cannot doubt, and the same remark may apply to adenoid vegetations, but such an occurrence is probably quite the exception. Enlargement of the tonsils is often associated with thick lips and stunted ill-formed features, which have something of the ugly type of struma in them; but any decided strumous affections, such as glandular abscesses or the like, are rare, except such as are the direct result of the tonsillar irritation. Its march is very uncertain; increasing under the stimulus of an acute attack of tonsillitis, it will remain stationary or retrogress for a time, and then again advance. Children generally "grow out of it," and at fourteen or fifteen years of age it ceases to be a disease of any importance. Rilliet and Sanné note that it is not uncommon to find a prompt reduction in the size of the tonsils after the first onset of the menses. It is, of course, sometimes continued on into adult life, and sometimes causes trouble in young adults in the same way as in children—viz., by inducing repeated sore throat. It is a particularly troublesome affection in those who have a voice for singing. It is associated with certain symptoms: First, it leads to snoring when the child sleeps—not in itself a matter of much concern; secondly, to deafness, from the pressure upon the orifices of the Eustachian tubes, and the associated hypertrophic or inflammatory changes which take place in the surrounding mucous membrane. This is of importance, because such children often appear dull and stupid simply because they are deaf. It interferes too with free vocalisation, and gives a nasal twang to the voice. It causes a frequent cough. Lastly, by partial occlusion of the air-passage, the lungs fill badly, and the chest becomes distorted; and it is said that from the want of full use the nostrils contract, the upper jaw fails to develop, and, in consequence, the arch of the palate remains high, and the teeth become cramped, from want of room. The chest becomes pigeon-breasted—that is to say, the ribs are flattened in laterally, and the sternum and costal cartilages become prominent, sometimes quite pointed. This is the natural result of interference with the ingress of air to the lungs. The respiratory effort continues, but the lungs fail to be distended by reason of the obstruction in the throat; and the ribs yield in obedience to the atmospheric pressure along their line of least resistance—in other words, in the parts of greatest movement—at their junction with the costal cartilages backwards to their point of greatest curvature.

Treatment.—No treatment is of much avail but excision, and if it should appear that any of the more serious consequences are in progress, this should be at once advised. But it is by no means always that an operation is necessary, and fortunately so, for parents often manifest great repugnance to it. Parrish's chemical food, or the syrup of the iodide of iron, and cod-liver oil are administered internally; the child is sent to the sea or to some healthy farm in good country air; the recurrence of attacks of angina is kept in check by local astringent applications such as the perchloride of iron with glycerine; the glycerinum acidi tannici, powdered alum, or boric-acid powder blown over the surface with a small india-rubber puff; and the hypertrophy gradually subsides, although it cannot be said that any one of the remedies prescribed has any constant value. The spray is very useful in these cases, and so also is the chloride of ammonium inhaler; either can be made very much of a toy. External applications to the angle of the jaw, turpentine, iodine, iodide of potassium ointment, &c., have been much recommended by some, but I have never found them of the slightest benefit.

Relaxed Throat.—Some children are subject to a relaxed throat; with a little cold or a little malaise, the throat becomes relaxed, as it is termed, and a dry, frequent tickling cough is the consequence. The soft parts are a little flabby, perhaps slightly congested. A good old-fashioned formula for such cases is a gargle of a glass of port-wine, with a little cayenne added, or a little perchloride of iron in glycerine may be used locally, and a tonic internally.

Hypertrophy of the Pharyngeal Mucous Membrane (Adenoids) may be mentioned in association with disease of the tonsils, as probably closely allied to the hypertrophy of those bodies, and requiring similar treatment. The mucous membrane covering the posterior wall of the pharynx, and extending upwards to the posterior nares, is thickened, fleshy, and thrown into vertical folds; in some cases there is more diffuse thickening, forming a velvety pad at the posterior part of the nasopharynx, and in some there are small knoblike projections of the mucous membrane.

The thickening in these cases is due to excessive development of the normal adenoid tissue which underlies the mucosa here, and which in structure closely resembles the tonsil.

This adenoid overgrowth may interfere with the action of the nostrils, and either by pressure or inflammation, disease may travel along the Eustachian tube, give rise to suppuration in the tympanic cavity and to perforation of the membrane. The presence of adenoid vegetations is usually associated with enlarged tonsils, but it is noteworthy that in some of the best-marked examples the tonsils are of natural size.

Symptoms.—In the most marked cases the child is deaf and stupid-looking, keeps its mouth half open, and stands with its head poked forward so that the shoulders have a stooping appearance. Respiration, even during waking hours, may have a snorting or snuffling character, especially in infants, and during sleep is usually accompanied by snoring. Sleep may be much disturbed; infants in particular often sleep only fitfully, waking at short intervals owing to the difficulty of respiration. The bridge of the nose is unnaturally wide, and it is thought by some that a narrow and high-arched palate may result from the respiratory obstruction; there is frequent cough, sometimes even sickness from the excess of mucus discharged, and the expectoration is occasionally streaked with blood. But such a description will apply only to the well-marked cases. There are many more children who with much slighter degrees of adenoid hypertrophy, are specially susceptible to "cold in the nose," and with the slightest "cold" snore much in their sleep, and get repeated attacks of earache and perhaps some ear-discharge, but at other times show little or no evidence of nasopharyngeal obstruction.

How far such mild degrees of adenoid enlargement are likely to produce any remote effects is open to question, but those like the more severe degrees have been blamed for all manner of nervous, respiratory, alimentary, and other affections.

That any marked and prolonged interference with respiration should have some harmful effect upon the general health seems only natural, and undoubtedly many children with such a condition are pale, pasty, and unhealthy, prone to frequent headaches, and constantly "below par": in such cases the effect of removal of the adenoid overgrowth is often to improve the general health considerably. It may be granted also that the presence of adenoids is often associated with a tendency to catarrh; and this catarrh may spread to the upper air passages and set up the laryngeal spasm which the Germans have called "pseudo-croup" (*vide* p. 319), or may occasionally spread further and lead to bronchitis, and possibly in predisposed children, to asthma. But when it is stated that slight degrees of adenoid hypertrophy which produce little or no other indication of their presence, are nevertheless responsible for asthma, night-terrors, enuresis, epilepsy, laryngitis stridulosa, mental impairment, and various other disorders, one must needs remember that such slight degrees of hypertrophy are extremely common, and that mere association is no proof that the "adenoids" are responsible for the evils with which they are found associated.

Diagnosis.—In some cases the adenoid vegetations are visible when the throat is examined in the ordinary way, but in most cases digital examination is necessary. Apart from this, the diagnosis must be made from the dull aspect, the deafness, the broad nose, the open mouth and snoring, particularly if the amount of enlargement of the tonsils is not sufficient to account for the extent of the sypmtoms.

Treatment.—In the slighter cases weak alkaline lotions such as sodium bicarbonate gr.v to the ounce or the same with borax gr.v, sodium chloride gr.ij, and glycerine ʒi to the ounce of water should be syringed through the nose, and the nasal and faucial mucous membrane carefully swabbed with soda and glycerine. By these means crusts are prevented from forming. Astringents may be applied to the tonsils and posterior nares, or boric-acid powder may be blown up the nostrils. In severe cases the thickened mucous surface must be removed by operative procedure; and in many cases the relief obtained in this way has been most decided.

This operation for the removal of post-nasal adenoid vegetations has become one of the commonest in the specialty that devotes itself to the diseases of the throat and nose. But I still adhere to my original opinion that we are too much under the thumb of routine regarding the treatment of these cases, and that the operation for the clearing out of the posterior nares is often done quite unnecessarily. I have known the operation to be advised when, although admittedly the growths were there, there was no single *symptom* of their presence. I have known the operation carried out in the absence of symptoms, and with, it was said, a marked improvement in the health of the child. Be it so. I am none the less sceptical as to the relation between the supposed cause and effect of this treatment; and, just as with the tonsils I demur to their being removed, in the absence of all evidence of their exercising any prejudicial effect, merely because they are large, so here, in the absence of all symptoms, I cannot understand the necessity for the removal of these growths, or why, when so ablated, the general health should undergo improvement. On the other hand, I have known the vegetations to return after their removal, and the patient to be none the better.

One might add that the operation is by no means free from danger. The risk of hæmorrhage is undoubtedly slight, but fatal cases have been recorded. There is a risk of meningeal infection, perhaps directly through the lymphatics; we have known cases where symptoms of meningitis followed the operation and even proved fatal. The pharynx after the operation is specially liable to infection; sometimes septic pharyngitis, sometimes a true diphtheria is grafted on the raw surface, and we have known this also to be fatal. A generalised septicæmia has followed in some cases, and septic arthritis has resulted in others.

We want more information about the frequency of these adenoid vegetations in healthy children. I believe they are present in *many*, and cause symptoms only in the *few*; and that the question of their removal should be determined, not by their presence alone, but by the evidence of obstruction of the nostrils, deafness, recurrent "colds" in the throat, distortion of the chest, and enlargement of the cervical glands.

Retro-pharyngeal Abscess.—The connective tissue between the pharynx and œsophagus and the bodies of the vertebræ is prone to suppuration in children, just as that of the ischio-rectal region is in adults, and the child is then said to have a retro-pharyngeal or retro-œsophageal abscess. It is not a common affection; but many cases have now been recorded in a long course of years. Dr. West gives sixty-eight cases, collected from various sources, and Bokai has added largely to that number. The data derived from them show that the disease is mostly idiopathic, or without obvious cause. Occasionally it follows measles or scarlatina, or the suppuration of neighbouring glands, and occasionally is dependent upon spinal caries.

It is not confined to any age; but as a disease of children it appears to be more common in infants a few months old. No doubt to this must be attributed the fact that the symptoms are obscure and liable to be overlooked.

Symptoms.—These somewhat resemble those of large tonsils. They are, difficulty in sucking and swallowing—perhaps evident pain in swallowing—and snoring respiration. Sometimes there are pain and rigidity in moving the head and neck, and sometimes a diffused swelling of the deep parts under the angle of the jaw. The fauces are covered with mucus and occupied by a rounded swelling, which pushes forward the soft palate, encroaches upon the rima glottidis, and to digital examination is elastic and fluctuating. These signs do not all develop at once; the maturation of the abscess is slow, and, apart from fretfulness and want of appetite, a certain amount of snuffling—which is attributed to cold—may be all that is to be noticed. During the course of some days—Henoch speaks of ten to fourteen or more, but some develop in two or three days (Sanné)—a swelling forms, and pressure signs supervene; first of these being a more pronounced interference with deglutition. Choking fits are easily induced, and fluids return through the nose. There may be more or less dyspnœa.

I have once or twice seen a diffuse suppurative cellulitis in this region without any tendency to localisation or pointing. Probably no well-defined distinction could be made between the two classes of cases; but the fever may be expected to be more severe, the swelling in the neck more diffused, and the outlook is decidedly more gloomy in the diffuse than in the localised form.

Prognosis.—If the abscess be opened, the pus evacuated safely, and there be no persistent cause in the way of caries of the spine, the child may do well; but so long as the abscess remains unopened, it may mature and open spontaneously, and the pus be sucked into the lungs during inspiration, and death from suffocation result.

Treatment.—The abscess should be opened as soon as possible, both to prevent any large increase in size, and to avert spontaneous rupture at an inconvenient time. The opening should be made externally behind the sterno-mastoid when there is reason to believe that the abscess is due to spinal disease, but in other cases it is simpler and better to open it from the mouth. The incision should be vertical, with guarded bistoury, all but the point being encased in strapping. Opening the abscess with the finger-nail, as suggested by Dr. Emmett Holt, may be convenient in some cases, especially where the symptoms are urgent.

Parotitis.—Mumps will be described with the other infectious diseases. There is, however, another form of parotitis—viz., that which complicates or succeeds to scarlatina, measles, typhoid fever, diphtheria, &c. It has been supposed, and probably correctly, that this form is of septic origin. At any rate, it commonly terminates in suppuration, and it is this that must be watched, for the abscess will often open into the external auditory passage. Pus should be evacuated by an incision as soon as it is detected. This disease has sometimes led to paralysis of the facial nerve, and it is a serious complication of any of the exanthemata or continued fevers, often foreboding a fatal issue. We have seen acute inflammation of the parotid follow laparotomy in children, as has happened so frequently in adults.

The **Œsophagus** is a part of the alimentary tract which may be said to have no pathology in childhood, it is so rarely diseased, and when it is, a diagnosis is but seldom possible. In a work of this kind, therefore, it will be sufficient to mention that thrush or diphtheritic membrane may extend along the tube: and that in rare cases an acute inflammation is found upon the post-mortem table, indicated by thickening of the walls, increased rugosity of the lining membrane, changes of colour on the surface from the usual pale opaque white to pinkish or even black, and more or less unevenness of surface from loss of substance. These appearances must not be mistaken for those of cadaveric origin, which are confined for the most part to the epithelial surface, to *staining* of the various tissues; and, very rarely, to perforation from gastric solution. Acute inflammation may, of course, be met with as a result of swallowing boiling water; and from the same cause, stricture of the tube is occasionally found in children of three or four years old. Perforation of the œsophagus by caseating mediastinal glands is occasionally found post mortem, but hardly ever gives rise to clinical symptoms. In 200 consecutive autopsies at the Hospital for Sick Children, Great Ormond Street, we found it twice. Lastly, we may mention that congenital malformations are met with now and then. The pharynx may end in a *cul-de-sac;* whilst the upper end of the œsophagus communicates with the trachea;* there are reasons also for thinking that stricture of the cardiac end of the œsophagus, a disease of adult life, may in rare cases be congenital. Some of these conditions admit of no treatment, and are necessarily fatal; some admit only of surgical treatment; and of those which are medical—thrush, diphtheria, and the like—the rules laid down in other parts of the book will supply all the information that is needed.

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* Ilott, *Trans. Path. Soc.*, vol. xxvii. p. 149. Shattock, *ibid.* vol. xli. p. 87.

CHAPTER XII.

MEASLES (MORBILLI).

Incubation.—By this is meant the time between the actual introduction of the poison and the appearance of the first symptom of illness. This has been established (1) by experiment, measles having been introduced by inoculation in Edinburgh, Italy, and Germany; (2) by the careful observation of outbreaks of the disease in what may be called virgin soil, such as that in the Faröe Isles, by Panum; (3) from the records of actual practice in our own climate. From all these sources it would appear that, though liable to modification within limits of three or four days either way, the incubation period centres round *ten* days.*

For instance, E. and F., of eight and ten, were at school from the 10th or 11th to the 19th of the month, with a child who then sickened with what was subsequently found to be measles. This child sneezed so much on the 19th that the mistress particularly noticed her. And on the 25th E. began to be poorly; on the 30th, a punctiform red rash appeared on the palate, and she left school for giddiness; and on the 31st, the eruption appeared on the face, and quickly spread downwards to trunk and legs. F. was sleepy, and had headache on the 30th; on the 31st the evening temperature rose to 100·4°, and symptoms of cold increased; on the 1st the punctiform eruption appeared, and on the 3rd the rash was noticed on the skin.

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* In commencing the subject of contagious diseases, I should wish to say once for all, as regards periods of incubation, that it seems to me futile to attempt, as is often done, to fix them too precisely: it is quite certain from the material already collected that the period varies for most of the exanthemata, and sometimes to a considerable degree. In measles the period is ten days usually, but in the case of a baby seen by Dr. Marshall, incubation was as long as three weeks. In a boy and girl in the Evelina Hospital, five and three years old respectively, it appeared to be at least twelve days in the one case and sixteen in the other:—A child fell ill with measles in one of the small wards of the hospital, and was at once removed to the fever ward. Sixteen days later the boy had rash upon him, and four days later the girl. These two were in adjacent beds.

These cases may also well illustrate the impossibility that often exists of exactly fixing the date of the introduction of the poison. Both children were at school, E. eleven days, F. eleven or twelve days, after the source of infection left, but it is not improbable that the house or room in which they were was infected, and that the actual reception of the poison by F. was of later date than that by E.

Prodromal Stage.—This is characterised by what is popularly called a cold, and lasts about four days, occasionally, however, it lasts only two days, and as in some cases mentioned by Mr. H. Balme,* occasionally it may last as long as eight or even nine days. The child is drowsy, sometimes remarkably so, and thus may give an early suggestion of what is coming; it has headache. Then comes redness of the eyes and lids and running from the nose. Next there is a dry cough, and the evening temperature begins to rise, the cough being sometimes markedly croupy. It must never be forgotten that laryngitis may be the only prominent symptom in the prodromal stage of measles. The urgent dyspnœa with cyanosis and stridor may, as we have several times seen, necessitate intubation or tracheotomy. In a certain proportion of cases also, laryngitis is the only symptom for the time being of the disease. A child is admitted during an epidemic of measles for so-called croup. No membrane is seen, no bacilli are discovered, the laryngitis rapidly subsides, and measles appears. The coryzal aspect—if the child is poorly, which generally means feverish—is very suspicious. The palate should now be carefully examined, and not infrequently the roof of the mouth behind the hard palate may be seen covered with a sharply defined red blush, with a number of minute red papules upon it. Described by various independent observers, the value of this blush as an initial symptom preceding the eruption by some hours is endorsed by Meigs and Pepper, Henoch, and others, and we have seen it well marked in some cases. Barthez and Rilliet do not, however, attach any value to it. Of greater value are the minute greyish specks which were first described by Filatow as occurring on the mucous membrane of the mouth in the prodromal stage. The value of these in the early diagnosis of measles has recently been emphasised by Dr. Koplik, whose name has now become associated with this symptom. Koplik's spots are seen as minute grey specks slightly raised, and sometimes with a narrow purplish zone around them, on the buccal mucous membrane usually about the level of the molar teeth and also just inside the angle of the mouth, and on the lower lip; these spots are present two, three or even four days before the appearance of the rash, and may thus be of value in enabling us to isolate suspicious cases during the most infectious period. So far as our own experience goes, however, these spots are by no means constant, and their frequency would seem to vary in different epidemics. It may be added that they are so small that considerable care and a good light are necessary in examining for them, and they must be carefully distinguished not only from minute patches of thrush, and specks of milk curd, which are of a more opaque white and differ also in being easily detached, but also from the distended follicles which one sometimes sees in the mucous membrane of the lips and cheeks. Other symptoms are occasional only, and therefore of little value; chief amongst these are epistaxis and vomiting. In young children the prodromal stage sometimes assumes the form of a bad capillary bronchitis.

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* *Practitioner*, October 1904.

Occasionally in the prodromal stage of measles a sort of premonitory rash appears which may resemble more or less closely the rash of rötheln or be scarlatiniform in appearance; we have known such rashes to occur in several cases in one epidemic. This premonitory rash may appear on the first, second or third day, and fades away before the characteristic eruption appears.

Eruptive Stage.—The eruption appears about fourteen days from the date of infection, or four from the first signs of illness. It is first seen about the ears, temples, and face, in the form of small, dull, red papules, tending to cluster more or less in crescentic lines, although not usually arranged with any great regularity. In favourable cases its course is now rapid; within ten or twelve hours it will have spread to the trunk, and even to the legs, and within twenty-four the face will be more or less covered with dull red, raised, and often confluent blotches, which strangely alter, not to say disfigure, the features. The face generally bears the brunt of the attack; it is not usually so thick on the trunk, and still less so on the legs. The temperature usually mounts, by evening rises and morning falls for the four days preceding the outbreak of the eruption, and then falls again rapidly when the rash begins to fade in twenty-four or forty-eight hours, and in mild cases it is normal or subnormal by the third or fourth day from the first appearance of the rash.

Case I.—Boy of 15.

4th day	M. T.	101°	eruption appeared.
	E. T.	104·6°	
5th ,,	M. T.	102°	
	E. T.	102·2°	
6th ,,	M. T.	101°	
	E. T.	99·6°	
7th ,,	M. T.	97·7°, &c.	

Case II.—Girl.

3rd day	M. T.	normal.	
4th ,,	M. T.	102·2°	eruption appeared.
	E. T.	103·8°	
5th ,,	M. T.	102·4°	
	E. T.	102·3°	
6th ,,	M. T.	98°	
	E. T.	99·3°, &c.	

But no great regularity can be depended upon in the prodromal stage; the temperature may, with only slight disturbance previously, run up quickly at, or just before, the outbreak of the eruption; or the height of the fever may be reached before the eruption appears. If the temperature remains high after the fourth or fifth day from the appearance of the eruption, the chest should be carefully examined and watched. Very commonly some broncho-pneumonia is the cause of this.

The eruption soon fades, but leaves the skin somewhat marbled by reddish-brown stains for some days afterwards, and it is often followed by slight branny desquamation, most visible about the face and neck, when the rash has been profuse. The pulse is full, soft, and considerably quickened during the height of the attack—120 to 140—and may even be intermittent for a few hours; but it speedily recovers itself at the first approach of a crisis. The bronchial affection is generally the most persistent part of measles. The disease is ushered in by a dry cough, and more or less catarrh results from this, consequently a loose cough or one associated with an excess of secretion may linger for some days. In many cases no more than this happens, the pulmonary parenchyma remaining healthy throughout, or at most showing no other abnormality than harsh breathing or an occasional rhonchus or râle. In severe cases the chest affection is paramount, and we then have to deal with a diffused broncho-pneumonia or capillary bronchitis, with perhaps a sluggishly appearing or retrocedent eruption, pallor of face, lividity of lips, dilating alæ nasi, and high fever.

Modifications.—It has been the custom to describe three or four varieties of measles, but it is enough to state that measles, like all other exanthems, is liable to vary. The typical disease is known by fever, a peculiar eruption, and a catarrhal inflammation of the respiratory passages. Common sense will tell any one that in very mild cases the catarrh may be absent or the eruption all but so. In bad cases, on the other hand, the eruption may become very dark-coloured or even petechial, and the catarrh, which is a part of the natural history of the disease, be replaced or added to by a more or less severe broncho-pneumonia. In such cases also it hardly needs the saying, the eruption may be irregular in its progress, or fitful in its appearance, and the general indications from pulse, temperature, and nervous system are likely to be grave in proportion. The condition, however, which is described by Barthez and Rilliet as *rougeole anomale*, is worthy of distinct mention, because it calls attention under one term to many puzzling cases in which the eruption comes out late or in some lagging fashion, and in parts of the body where we should perhaps not expect it, such as on the abdomen or extremities. Measles may appear first on the buttocks, for example, where eruptions of all sorts are so common, and should the child have been ill for four or five days with acute pneumonia, the real disease might well pass unrecognised. I would also add that, now and again, measles may cause an amount of cyanosis quite disproportionate to the amount of the eruption—indeed, I would say apparently independent of it—and by no means corresponding to the severity of the disease. I have known it then, not unnaturally, arouse considerable anxiety, and lead to the vigorous inhalation of oxygen; and yet, from the rapidity with which the symptoms disappeared, it was probable that it had no sinister importance. I am uncertain whether this be due to the blood condition, parallel to the dusky colour produced by typhus, or whether to some temporary pulmonary engorgement at the onset of the disease, which disappears as the disease develops. Certainly I have seen it where the physical signs in the lungs betokened something of this sort, although the general symptoms gave no indication of pulmonary stress.

Complications and Sequelæ.—Of these, by far the most important, because most frequent and most dangerous, are broncho-pneumonia and membranous laryngitis or croup. Of others may be mentioned marasmus, diarrhœa, whooping-cough, and, as late oncomers in unhealthy children, a tribe of glandular and other affections—ophthalmia, discharge from the ear, suppurating glands in the neck, caseating mediastinal glands, and general tuberculosis. Albuminuria is a rare sequela. I have seen it once in the second week. Nervous complications are not very frequent. Convulsions are seen but rarely in the eruptive stage, usually in the more severe cases; they are still more rare at the onset of measles. In the most severe cases with intense dusky rash the patient may fall into a comatose condition which is likely to prove fatal. We may mention here as quite distinct from this, transient attacks of coma which we have occasionally known to occur during convalescence from measles; a child apparently doing well, with the rash already fading, may lapse into unconsciousness, and after remaining comatose it may be for several hours, recover without apparent ill effects. Sometimes the coma may last for days but in these cases there is a risk of some permanent cerebral defects.*

Broncho-pneumonia, being in a measure part of the natural history of the disease, is the most common and the most destructive to life. When it comes on suddenly, as it may do in young children, the eruption may be slight, but the temperature often rises in these cases to 105° or 106°, the child becomes pallid or livid, and dies in a semi-collapsed state. Naturally there are all degrees of pulmonary affection between this the most extreme and the milder cases.

Membranous Laryngitis is another outcome of measles, and must be distinguished from the acute laryngitis which occurs in the prodromal or eruptive stage, and is not membranous. It may attack the child at any time; most usually within a week or ten days after the subsidence of the rash.

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* *See* Case of Coma with Measles in an Adult followed by Recovery. By G. Newton Pitt, M.D., *Clin. Soc. Trans.*, vol. xxxvii.

It is probably epidemic in its occurrence—that is to say, is more prone to occur at special times than to attack all cases of measles indiscriminately. But from its gravity the possibility of its onset should never be forgotten, particularly if the laryngeal cough has been troublesome or persistent during the fever.

Diarrhœa is another associate which may either usher in or follow the disease, and is described by Henoch as sometimes being very profuse and dysenteric in character. It also is epidemic in manifestation.

Marasmus I note for this reason, that when very young children—a year to eighteen months or two years old—are attacked with measles, it may happen that the eruption comes out sluggishly, the fever persists, though not to any excessive degree—102° to 103°—the tongue and mouth become dry and ulcerated or covered with sordes, and rapid emaciation takes place; and this without any pronounced broncho-pneumonia, croup, or other fatal accessory.

Whooping-cough is generally spoken of as being especially related to measles, and certainly the impression that is left upon my mind, as the outcome of experience is, that the two affections often follow one upon the other. But when an appeal is made to statistics the association appears to be less common than I had anticipated. Of 305 cases of pertussis of which I have notes, measles is only mentioned as recent in fourteen. There would appear to be some difference of opinion also as to the relation which the two diseases bear to one another. West speaks of measles as following the pertussis. My own experience is contrary to this. In all these fourteen cases the measles came first and the pertussis closely followed. For instance, a girl aged thirteen months was well till six weeks before admission; then came measles, and after fourteen days pertussis. But the cough may follow within a day or two of the outbreak of the measles. When measles follows upon pertussis, the characteristics of the latter may temporarily disappear. What the real relation of the one to the other may be can only be a matter of conjecture, but it is probable that for measles, pertussis, membranous laryngitis, and varicella—all of which seem prone now and again to combine—the presence of any one lessens the resistance, which a healthy body manifests to the infective power of the others. A child therefore with measles would be more susceptible to either of the others should it be epidemic at the time. *Noma* and *necrosis of the nasal cartilages* after measles have been recorded. The former is probably not uncommon. Jacobi speaks of it as common, and Dr. Lewis Marshall tells me he has seen many cases where noma pudendi has followed. As late results of measles there are many indefinite conditions of ill-health when the disease has been severe or neglected. It is certainly far from uncommon in the out-patient practice of a children's hospital to hear the tale that the child has never been well since the measles; and this in all sorts of affections—marasmus, glandular abscesses, skin affections, &c. It is, however, very difficult to arrive at facts, but it is my belief that a very common result of measles is *cheesy degeneration of the mediastinal glands*, and a subsequent tuberculosis of the lungs. As I shall state elsewhere, one of the commonest forms of chest disease in childhood is this —a cheesy enlargement and softening of the mediastinal glands, and one or other form of lung disease supervening—generally a miliary tuberculosis, but not always. The history of many of these cases credits measles as the source, and nothing would seem to be more probable. Measles with its bronchitis or broncho-pneumonia is followed, no doubt, in most cases by more or less inflammatory swelling of the corresponding lymph glands, which, becoming choked with inflammatory products, undergo cheesy degeneration. Moreover, although less liable than scarlatina to any marked affection in the course of the fever, the glandulæ concatenatæ frequently undergo some slight enlargement and induration after measles, and no doubt slight changes originate then which, in unhealthy subjects, or from subsequent neglect, may run on into the chronic enlargements, cold abscesses, scrofulous ulcers, &c., which are so well known and so much dreaded.

Etiology.—Measles exhausts the soil, and, as a rule, occurs only once. But in some cases a second attack or relapse follows the first after a short interval; in others, a true second infection must occur, the second attack being many years after the first. Dr. Marshall, of St. Margaret's Bay, gives me interesting details of two such cases. He writes: "There has been an epidemic of measles here this winter, and two children who had undoubtedly true measles last July have had a second attack, running exactly the same course this March." Again: "A little boy nearly lost his life from measles last November; he has had a second attack this spring, in common with other children, in the course of a recent epidemic." Sucklings appear to be less liable to infection than older children, and when attacked often have the disease in a mild form. Measles is highly contagious in the catarrhal or pre-eruptive, and also in the eruptive, stage. After this it would appear that the infective power becomes much less active and soon disappears. But there are cases on record of infection being conveyed in the third week after the outbreak of the eruption, and therefore the rule to be pursued is that if possible a month should be allowed to pass from the onset of the eruption before a child is again permitted to mix with healthy children. It is probable, however, that very little risk indeed is run at the end of the third week, provided that the child is not surrounded by a more recently infected atmosphere, or by clothing improperly disinfected. Measles is chiefly conveyed directly from the sick to the healthy, but it can be, and is sometimes, carried through the medium of healthy persons by fomites in the clothing. Such cases, however, usually show cause for copious infection—the medium being either a child coming from an infected house, or somebody who has recently been in contact with the sick.

Quarantine.—Isolation in a family is not usually practicable in any strict fashion, but it should certainly be carried out as fully as possible, and with particular care for healthy children under four years of age, or for those who are delicate. In healthy children above that age, seeing that the disease so usually runs a favourable course, it is a question whether rigorous measures are worth attempting. Moreover, of isolation let it be remembered that to be effectual it must be put into practice early, not when the eruption appears, but at the very onset of the catarrhal stage. This can be done best by the methodical use of the thermometer for every child that has been exposed to infection, and if there is any rise of temperature the presence of Koplik's spots may be a useful indication for isolation (*see* p. 178). Measles being in a house, no child from thence must be allowed to mix with others. When a child has had measles, it may go back to school at the end of three weeks if all desquamation and cough have ceased.*

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* "A Code of Rules for the Prevention of Infectious and Contagious

Morbid Anatomy.—Nothing is yet known for certain as regards the state of the blood. Bacilli have been found in the blood of patients suffering from measles, but at present, though everything points towards future advances in the direction of associating it with a specific organism, nothing can be stated with certainty.

Drs. Braidwood and Vacher describe minute bodies obtained from the breath, and also in the skin, lungs, liver, &c., after death.*

The macroscopic appearances consist chiefly of more or less injection, perhaps even superficial erosion about the palate and epiglottis, sometimes also of the intestine; and a diffused broncho-pneumonia. This last has no special pattern, and need not be described here, as it will be found in its place as one of the diseases of the chest. Atelectasis is not uncommon, and pleurisy is often associated with the pneumonia. As less common complications, membranous laryngitis, diphtheria of pharynx or conjunctiva, keratitis and colitis, have occasionally been found. As a later condition Henoch describes a chronic broncho-pneumonia with dilated bronchial tubes and terminal abscesses in the lungs; but I am not clear that this can be separated from the far more common condition of cheesy degeneration of the bronchial glands and lung with miliary tuberculosis superadded. Some authors describe an acute fatty degeneration of the liver, but this is a change which is not peculiar to measles, and the same may be said of the early cirrhotic changes found by Crooke.

Diagnosis.—In cases beginning with acute laryngitis, the diagnosis from diphtheria may be impossible until the rash appears, but a sudden onset of acute laryngitis in a child with no visible membrane, especialy if coryza be present, should always suggest the possibility of on-coming measles.

The cardinal points in the diagnosis of measles are the slow onset and the coryzal aspect. In scarlatina, from which the difficulties chiefly emanate, the child is taken suddenly ill. often with vomiting, and within twenty-four hours the eruption appears. In measles there is less often sickness, and the rash does not

Diseases in Schools," passed by the Medical Officers of Schools Association London: J. & A. Churchill. 1885.

* *Trans. Path. Soc. of London*, vol. xxix. p. 422.

make its appearance for four days. Of the eruption it is less easy to speak dogmatically; it is true that in typical cases the distinctions are plain, perhaps in few diseases more so, but there are many cases where from the eruption alone an opinion is impossible.

For instance: a child, seven months old, was brought with what was clearly measles—coryza of two or three days and a characteristic swelling of the eyes. The eruption is thus described: "There is a general red blush of the skin of the entire body, with additional raised small bright red papules, running sometimes in a crescentic pattern. The rash has some of the characters of scarlatina, some of measles." There will come to every one cases in which it is impossible to speak with certainty. In such it is necessary to take note of all the features of the case, and to form an opinion only after due deliberation—in the meantime taking all proper precautions. No discredit can attach to indecision when a decision is an impossibility; and, on the contrary, nothing can be more damaging to the reputation than an ignominious retreat from a hasty diagnosis of "rose-rash," or "German measles," before the developed and cold logic of facts. Eruptions much resembling measles are occasionally produced by articles of food and drugs. These are for the most part apyrexial, and they have none of the coryzal aspect of measles; and almost as much may be said of rötheln or rubella, in which there is mostly little fever and no catarrh.

Treatment.—In the prodromal stage the child should be kept in one room in a regulated atmosphere, of a temperature of about 65°. As the cough becomes more troublesome, some sedative, such as the compound tincture of camphor, may be given—twenty or thirty drops every three or four hours for a child of four or five years. The diet should consist of plenty of milk and water or barley-water, with any farinaceous food that may be fancied, and bread and butter or toast. When the rash appears the child is to be kept in bed, and in an ordinary case very little more is required. If the skin itches, as it sometimes will, the body may be oiled three or four times a day with carbolic oil (1 in 40). If the temperature rise to 103°, a warm bath, 98° to 100°, may be given as often as necessary. This acts as a good soporific in many cases. The cough is to be treated by small doses of the compound tincture of camphor or some such expectorant as F. 37.

If these means are not sufficient, nothing relieves the hoarse hard cough of measles, which appears to be dependent upon an inflammatory condition of the rima glottidis, better than painting the fauces and throat with glycerine, or borax and glycerine, by means of a laryngeal brush. If painting be difficult to accomplish, the child may swallow a little glycerine of borax, or failing that suck a glycerine jujube occasionally.

At the height of the eruption, the temperature not uncommonly runs up to 104° or 105° for a few hours, without any corresponding severity of the other symptoms. There is no need to interfere for a temporary disturbance of this sort, but for a persistently high temperature of twelve hours or more some anti-pyretic may be given, or bathing resorted to. Of anti-pyretics that most in use at the present time would appear to be phenacetin. It may be given in doses of one to three grains or more. Its anti-pyretic action is pretty certain, but the *extent* of it variable. Therefore, I think it advisable to begin with a small dose of one grain, which I should give at any age from two to six or seven. If the temperature falls afterwards, wait and note the extent of the depression. If not, repeat the dose in an hour's time. The drug is usually given when the temperature rises to about 103°, and is repeated as often as may be necessary to keep the pyrexia below that limit. It is very insoluble, and may be given in powder in milk; but it may be dissolved in rectified spirit, with tincture of orange and water. As regards the *bath*, the first may be at a temperature of 95° to 98°. The temperature will often fall, and sleep come by this means alone. If this fail to reduce the temperature, tepid or cold sponging may next be resorted to, or the chest and abdomen may be covered with an ice-pack or cold compresses. As a last resort the tepid or cold bath must be tried. The child should be undressed quickly, so as to be worried as little as possible, and then immersed in a bath of the temperature of 90°, which may then be rapidly cooled by the addition of cold water to 80°. Five or six minutes immersion is usually sufficient. The child is then dried rapidly by a soft towel, and put to bed again *between sheets*. It is now to be watched carefully, and the temperature recorded every two or three hours. The effect of the bath is sometimes very powerful, and the child remains livid-looking and collapsed for some time. In such cases small doses of brandy must be administered in warm milk at frequent intervals, and a hot bottle kept to the feet. Some go so far as to say that, when the temperature reaches 102°, some one or other of these means is to be resorted to. Such a rule as this seems to me to be a meddlesome practice which, to say the least of it, is unnecessary. There may be cases in which, with a temperature of 102°, the child is very ill, and the fever may be judged to be more than usually detrimental. For such, a bath, either tepid or cold, or cold sponging, may be recommended; but for one such case there are many others which run a perfectly favourable course, with a temperature even as high as 105° or 106° for a few hours, and in which it may reasonably be asked in what way anti-pyretic applications could have bettered them. Each case must be judged upon its merits. Severe measles causes much exhaustion; this is best combated by the free administration of champagne or brandy. Ammonia and digitalis are also called for when there is severe broncho-pneumonia or a failing heart. Quinine is sometimes useful in lowering the temperature. It may be given in one- or two-grain doses, or more, according to the age of the child, three or four times in the day. Dr. Starr recommends its administration by suppository.

As regards the length of stay in bed, measles varies so much that no rule can be laid down. It is generally well to keep a child in bed for a couple of days after the temperature becomes normal, and to its room for a week further. It should be kept indoors for three weeks or a month, unless the disease has been very mild and the weather be warm. The room occupied by a child with measles is to be kept well ventilated. In most cases the window may be allowed to be a little open at the top: all draughts are to be avoided, and in obtaining fresh air the temperature of the room must not be allowed to fall.

Broncho-pneumonia, if it exist, must be treated as in other cases. If the child be feeble, a few drops of sal volatile or a grain of carbonate of ammonia may be given, and some liquid extract of liquorice; or expectorants, such as squill, ipecacuanha, and compound tincture of camphor, may be necessary. Counter-irritation may be applied by mustard-leaf for a few minutes over the diseased part, followed by a warm fomentation or cold pack at first, and then a cotton-wool jacket. The diarrhœa that sometimes accompanies measles is probably due to some catarrhal state of the gastro-intestinal mucous membrane, and the first thing to be attended to, therefore, is the quantity of food that is being taken. The milk may be too much, and thin broth or cream and whey, or egg albumin, may suit better for a few hours. In severe diarrhœa cold compresses are very useful. Several folds of linen are to be wrung out of cold water, put over the abdomen and covered with flannel, and changed every two or three hours. An ice-bag or an ice-poultice answers the same purpose. For medicines, thirty drops of brandy with some syrup and cinnamon-water is a simple and an effectual remedy repeated every three or four hours. A teaspoonful of fluid magnesia is a good thing to commence with, given two or three times a day, and subsequently, if not successful, a few drops of dilute sulphuric acid may be given with a drop or so of opium. Dover's powder is also useful for such cases, and so also the liquor bismuthi, the subnitrate of bismuth, and the liquid extract or wine of coca.

Membranous laryngitis will require a treatment such as that indicated in its special section; but it may be said here that probably much may be done in measles to avert its onset if the throat and fauces be painted energetically with a solution of boric acid, or borax and glycerine, every hour or two whenever the cough becomes at all croupy in character.

Other parts require also careful attention. The ophthalmia which often succeeds to measles needs cleanliness and some mild antiseptic wash—permanganate of potash being one of the best. The ear is prone to discharge after measles; if so, it is at once to be taken in hand and treated carefully and regularly on antiseptic principles. It is to be gently syringed with a weak spirit solution, a tablespoonful of spirit of wine to the tumbler of water, and carbolic acid (1 in 40), glycerine and borax, or the solution of boric acid in glycerine, dropped in afterwards, and a little salicylic wool placed in the orifice. This is to be done three times a day, and every effort made to keep the part sweet. Some prefer what is called the "dry method," and it is certainly very useful. It consists simply of blowing powdered boric acid or iodoform, or any unirritating antiseptic that may be chosen, into the external auditory meatus by means of one of the small caoutchouc puffs made for the purpose. The great danger of aural discharge is its liability to decomposition, and decomposition of the discharge leads to extension of the inflammation to the bone which limits the tympanic cavity, and so to necrosis and its consequent evils.

For some weeks after measles the health demands extra watchfulness. A salt-water bath should be given in the morning, and the clothing be always warm. Anæmia must be treated by iron and cod-liver oil. Any capriciousness of appetite should be guided, if possible, back to normal by the same means, or by the judicious administration of stimulants, and above all by change of air—a dry, bracing air, whether it be sea or inland, and plenty of it. If there be any tendency to enlargement of the glands, no doubt sea air is the better; otherwise I am inclined to think that a farmhouse life, with its freedom from restraint, its good milk and bread, and its rough-and-tumble exercise on a farm pony, is the best restorative in existence.

CHAPTER XIII.

SCARLATINA.

Of all the diseases of childhood, there is none which presents greater varieties of aspect than scarlatina—none which so often brings, with very short notice, unexpected deaths into a healthy household, or which more often selects for its victims the robust and healthy. Thus writes the late Dr. Hillier; and it would be difficult to put more shortly and more graphically the terrors of this scourge. Some years ago, when taking charge of a practice in the country, I was called to a village some miles away to see a child who was very ill. I found a well-nourished girl of about five years old. She was pulseless, livid, and comatose, with an almost petechial scarlatinal eruption covering the skin. I was told that she had been quite well till the preceding afternoon. She had suddenly vomited while at the Sunday-school, and came home ill. I saw her about 8 P.M. the next day, and she died within three or four hours; so that the duration of the disease from its outbreak to the death of the child was under thirty-six hours. But one seldom sees such malignant cases now.

Scarlatina is in great measure a disease of childhood, 63 per cent. of the deaths, according to Dr. Murchison, being under five years of age; 90 per cent. under ten; and 95 under fifteen years. The disease is not prone to attack children in the first year of life, and this is more markedly the case even than with measles; but it may occur at any age, and cases are on record where infants have been born with the eruption upon them, and in which desquamation has occurred in due course. Meigs and Pepper have seen it perfectly well marked in an infant twenty-one days old. It is a disease which occurs in epidemics, though no large town is ever quite free; and it varies much in severity. It has a well-marked seasonal maximum in October. Epidemics differ from each other in this respect, and case from case. To be infected from a mild form is no guarantee of an equally mild attack. It is a disease which spreads by infection, though it is often difficult to fix the source of this.

Incubation.—This is somewhat variable. It may be only a few hours—in many cases it is stated not to exceed forty-eight hours; in the majority, however, it is three or four days; it rarely exceeds seven days. Consequently any one who has been exposed to the poison of scarlet fever, and who does not sicken within a week of quarantine, may be pronounced safe. The disease is generally latent at this stage, and the child retains its ordinary health.

Prodromal Stage is short; so much so that it is common to find a child quite well, or apparently so, till it suddenly turns pale and vomits; and from that time onwards it is seriously ill, its extremities perhaps cold, the fever high, and its whole aspect one of dulness and exhaustion. The disease may set in with convulsions or bad headache, but this is not common. More often there is some soreness of throat for a day or two before the child regularly sickens.

Eruptive Stage.—Within a very few hours of the initial symptoms, during which the child will be more or less heavy and prostrate, and in high fever—perhaps vomiting frequently, perhaps with bad headache, perhaps convulsed—the eruption appears. It is seldom delayed beyond twenty-four hours. **The rash** consists of a general rosy blush, upon which are set darker red points, the surface being smooth, unless, as often happens, it is accompanied by milaria. The dark red points in the eruption are sometimes distinctly raised. In case the red blush is not too diffused, the healthy coloured skin peeps out here and there. The puncta may be even petechial in places. The rash appears first about the neck and shoulders, and rapidly spreads over the trunk and extremities. It is not always evenly diffused; on the contrary, it is sometimes so patchy as to create a doubt about the diagnosis. For instance, I have seen it almost confined to the buttocks, the back, or the ankles. The face is said by some authors not to be often affected, but this is not strictly correct. There is not the punctate rash seen in other parts, but a diffused blush is by no means uncommon. The rash is accompanied by some swelling of the skin. The outbreak of the eruption is attended with a still rising temperature, with increased soreness of throat, and with a very rapid pulse. The **extreme rapidity of pulse** is indeed one of the characteristics of scarlatina, and it goes for little as an indication of the gravity of the case. A pulse of 160 is no uncommon feature. The sore throat is due to some swelling of the tonsils, but more especially to a general swelling and vivid redness of the whole mucous membrane. The tonsils, uvula, and palate generally are highly injected and swollen. The tonsils are covered with secretion of puriform appearance, and are more or less ulcerated after the third or fourth day. The tongue at the same time is thickly furred with a white or creamy fur, through which peep brightly red swollen papillæ. The edges of the tongue are often free from fur, and are brightly red, the papillæ being bulbous-looking from swelling. This constitutes the "**strawberry tongue.**" The fur gradually clears away as the disease subsides, and leaves an unnaturally raw red-looking tongue. In severe cases the throat is badly ulcerated, or shows patches of membrane upon it. The lymphatic glands in the submaxillary region are enlarged—in mild cases moderately, in bad cases much. At this stage the urine should be free from albumin. It is usually somewhat scanty, the chlorides, and later the phosphates, being diminished. There may be a trace of blood by the guaiacum test, and there may even be albumin or casts.

The **temperature** may rise to any height between 102° and 105°, and it remains high for three or four days. It gradually subsides as the rash disappears, and, if no complications arise, becomes normal in seven or eight days. It is often hindered in its descent, however, by a disproportionate severity of the disease of the fauces—ulceration of the mucous membrane, or swelling of the lymphatic glands—and many young children pass into a condition not easily described, in which the temperature remains high, with a raw, red condition of the mucous membrane of the mouth, a dry skin and general debility lasting for many days.

At the end of a few days **desquamation** begins. In nineteen cases noted by Hillier, its commencement varied from the sixth to the twenty-fifth day. The skin having remained harsh and dry meanwhile, now becomes covered with small branny scales, while about the palms of the hands and soles of the feet larger scales are detected. Occasionally in these parts the entire epidermis is shed *en masse* as a glove, the nails perchance coming off also. The natural duration of the desquamating stage is well-nigh unlimited—the scales being like the dead leaf or blade of grass which depends upon external forces for its removal—but it is advisable to determine it as quickly as possible, and this may be best done by the frequent repetition of warm baths, scrubbing, and frequent oiling.

Modifications.—Such, shortly stated, is typical scarlatina. But this is hardly sufficient—it is necessary again to remind the student that there is no disease which deviates more from a type than this does. The time-honoured description of three forms —the simple, anginal, and malignant—testifies to this. I shall adopt no such subdivision, for the simple reason that there are so many varieties or degrees of severity which pass as such, that it is less perplexing to the student to follow recent authors in stating generally that sometimes it is so mild that the illness is hardly appreciable, and there is either no eruption or it is of the very slightest amount; sometimes the eruption fades in a day or two in place of lasting five or six days. Again, the intensity of the disease in the throat varies much. It may be very little; it may, on the other hand, be attended with extensive ulceration, and even the formation of membrane. At another time the fauces may at the most not indicate any severe affection, whilst yet ulceration is insidious, progressive, and ultimately extensive. As regards the disease in the throat, it is the most regular in its appearance of all the symptoms; it is certainly often present when scarlatina is rife without any other symptom, and patients thus lightly affected are for the most part protected from subsequent infection. In young children, it is well to remember that it may be present to a considerable extent and pass unnoticed, the refusal to take food which indicates its existence being attributed to the anorexia of the febrile state. The enlargement of the lymphatic glands at the angle of the jaw is the best evidence of its presence and its extent, and whenever there is any swelling at the angle of the jaw, a careful examination of the fauces should be made.

With reference to the question of malignancy, scarlatina is a disease which, like small-pox, is sometimes so destructive that its entrance into the system is sufficient to put a stop to all natural processes and to bring about coma, collapse, and death within a few hours.

In cases such as this, as already narrated, the child vomits, the temperature runs up to perhaps 105°, the pulse becomes very rapid and feeble; the extremities become cold, the face lividly pale, and there is often profuse sweating.

In a less rapidly fatal and more prevalent form, the fever runs on for four or five days with delirium, and perhaps vomiting, and the child succumbs, exhausted, with dry tongue, possibly stupor, convulsions, and coma, towards the end of the first week. But there seems some reason for thinking that the disease is generally becoming of a milder type—at any rate this severe form does not seem to be as common as in former years.

Complications.—Strictly speaking, there are not many. The ulceration of the fauces may be extensive and lead to hæmorrhage, or to the rapid formation of glandular abscesses, or even to sloughing of the skin. The inflammation of the fauces sometimes extends to the larynx, as in diphtheria. Troublesome epistaxis may occur during the eruptive stage. Then again convulsions may suddenly set in, generally in association with the sudden onset of albuminuria, but sometimes they may be associated with the onset of meningitis, which is, however, a rare complication, or with the commencement of some intercurrent inflammation. Sometimes in severe cases, as already noticed, there ensues a condition of coma and rapidly fatal collapse. Diarrhœa is sometimes troublesome; occasionally, too, the joint affection known as scarlatinal rheumatism may set in early, and may be associated with endo- and more rarely with peri-carditis, and it may be that in severe cases the synovitis is of a destructive form, and the joint rapidly fills with pus, or thin purulent fluid. Scarlatina may be associated with other exanthems and fevers. I have seen the eruptions of varicella and scarlatina both out at the same time. Dr. Gee has seen the same, and Mr. Fraser, of Romford, tells me of another similar case. Diphtheria or typhoid fever may either of them run concurrently with it—as regards the latter, it has usually been that scarlatina has occurred in the course of typhoid fever—and both measles and small-pox are occasionally superadded to scarlet fever. The supervention of diphtheria is very likely to be fatal, but measles and varicella neither alter their course, nor that of the scarlatina, nor do they necessarily increase the gravity of the prognosis.

And here may be mentioned what has been called **surgical scarlatina.** It has been noticed by many observers that a red scarlatina-like rash sometimes appears after operations, the nature of which has seemed doubtful from its quick appearance within a day or two of the operation, and the modified course which it often runs—chiefly in the direction of mildness and rapid subsidence. From what has already been said on the incubation of scarlatina, these will seem but hazardous distinctions with which to combat the scarlatinal nature of this affection; but there is now no longer any doubt that it is true scarlatina for the following reasons, which are admirably stated by Dr. Gee: That it occurs in epidemics; that a severe case (with bad sore throat and even albuminuria) occasionally relieves the monotony of the mild form; that the disease is not exclusively confined to patients who have been subjected to operation; and lastly, that, however freely these patients are exposed to scarlet fever contagion afterwards, they do not contract the disease. It might be thought that an operation or open sore would naturally render its subject more liable to develop a disease which is propagated by fomites, since erysipelas is known to attack such cases with peculiar readiness, and probably enters by the wound. But from some observations made by Dr. Paley and myself at the Evelina Hospital,* it appears probable that the poison does not gain an entrance by this means; for the antiseptic treatment of wounds, a most effective bar to the occurrence of erysipelas, is none to the advent of scarlatina. Several interesting hypotheses have been advanced to explain the readiness with which operation cases develop scarlatina. Sir James Paget attributed it to the lessened resistance induced by the surgical operation. It appears to me, however, that, being by no means confined to the subjects of recent operations, the more probable explanation is that some modified process of incubation takes place in any inflammatory focus that may be existent. This, however, is not the place to discuss a question of such a kind—the important point for the student to lay hold of is that surgical scarlatina is true scarlatina, however modified, and must be dealt with as such.

Relapses are not very rare. Hillier mentions the case of a student who had had three attacks of scarlatina, and a week after his third attack he had a distinct relapse. Thomas describes pseudo-relapses in which a roseolous eruption breaks out after the fever has run its course. They generally terminate favourably.

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* "The Etiology of Scarlatina in Surgical Cases," *Guy's Hosp. Rep.*, vol. xxxix. p. 287.

A second attack of scarlatina in the same individual is much more common. Indeed, of all the exanthemata, scarlatina is the one which is least protective against its recurrence. The large majority of persons are exempt, however, from any typical recurrence, but when scarlatina is prevalent, sore throats are common even in those who have suffered from the disease at some former time.

Sequelæ are numerous. They are—nephritis, leading to albuminuria and dropsy; dropsy without albuminuria, convulsions, serous inflammations, glandular abscesses, diphtheria, otorrhœa, rheumatism.

Scarlatinal Dropsy, always understood to mean nephritis and albuminuria, may occur at any time, and should always be watched for throughout the attack. It most usually begins during the desquamative, but it may begin in the eruptive stage. If the urine be carefully tested, a transient albuminuria, or the presence of blood, is probably not uncommon in the first week of scarlatina, and I have seen, as probably most of us have, a severe nephritis begin suddenly as early as the fifth day. I have also seen the urine copiously albuminous at the first outbreak of the eruption, and natural again within four days; but this is certainly rare. As a rule, however, the stage of desquamation is the time for albuminuria, and the urine should be carefully tested day by day until this stage is completed. The frequency of albuminuria appears to vary in different epidemics. Some practitioners may be found who have but seldom come across it, and who indulge in the belief that it results from neglect or bad treatment. This is not correct. There can be no doubt whatever that the *materies morbi* of scarlatina is particularly obnoxious to the kidneys. In the early days of the fever the urine will often reveal by excess of mucus, epithelium, hyaline casts, and occasionally by blood and transient albuminuria, distinct evidence of renal disturbance; children, too, become dropsical and albuminuric while yet in their beds, and with the eruption still out upon them. Nevertheless, this is a wholesome belief, as it makes for what is a powerful prophylactic treatment, and there can be no doubt that much less would be heard of scarlatinal dropsy were children dieted more strictly, and confined during convalescence more rigorously to bed, or to their room, than has often been the custom hitherto. The albuminuria varies so much in duration, according to the severity of the nephritis that occasions it, that it is impossible to speak in any precise way of its course. In mild cases it may last only a few days, the albumin never being in large quantity. If there be much, and blood, then there is severe disease of the kidney, and its course will be such as an acute nephritis is known to take—a lingering one, lasting perhaps a month or six weeks, and often much longer. Nevertheless, it does occasionally happen that a considerable quantity of blood or of albumin appears quite suddenly, and disappears in the course of a day or two, almos as suddenly. Albuminuria is said most commonly to set in towards the end of the second week; but so long as desquamation lasts, an uncertain period of some weeks, there is a chance of its occurrence. In thirty-four of my own cases, of which I have notes, the dropsy was noticed—in the first week in two, in the second in eight, in the third in seven, in the fourth in nine, at some later period in four, and in four the relation to the eruption is uncertain. It usually commences with fever, perhaps with vomiting, and the pallor which comes over the child's face is often most striking. I have not often seen the pulse presenting those characters of resistance or hardness which are recognised so quickly in adults. It is stated to become preternaturally slow, fifty to sixty. It is more common to find it irregular. The evidence of cardiac disturbance is indeed often striking. The impulse is displaced outwards, and may be felt sometimes at one spot, sometimes at another. The beats are irregular in their force, and halting in time; the first sound may be thick and murmurous, or accompanied by a distinct systolic apex bruit, and the second sound is accentuated. Twelve cases out of thirty-four gave evidence of heart disturbance such as this, and in six of the twelve there was a distinct bruit. The urine quickly presents characteristic appearances; it becomes scanty, is passed frequently in small quantities, and is either smoky or deposits a dirty-brown sediment, or may be port-wine coloured from the presence of pure blood in quantity. It is usually highly albuminous, and shows corpuscles, large epithelial and hyaline casts, and much granular detritus under the microscope; but there is much variation in this respect. In the less acute cases the albumin may be in moderate quantity, the colour but little removed from a normal standard, and urates present in considerable quantity. The dropsy of the face, and in severe cases of the subcutaneous tissue generally, is prone to follow quickly, and seemingly often suddenly. When the disease runs a favourable course, the albumin may remain in the urine in good quantity for four or five days; but it quickly diminishes, the blood disappears, the urine increases, urates begin to be passed, and gradually all the symptoms disappear.

Unfortunately there are many other less favourable results. The disease may set in with convulsions or the urine may become gradually more scanty, the dropsy more extreme, and convulsions supervene after four or five days, or more. Convulsions are necessarily serious, and are often fatal; but in many cases they subside, the child remains drowsy for a few days, and gradually comes round again.

At another time a child will seem to be doing well, with but a moderate amount of dropsy and albuminuria, when somewhat suddenly its breath becomes short, coarse râles appear in all the bronchial tubes, and death follows quite rapidly, and even not uncommonly suddenly and unexpectedly. These are they who are said to die by acute œdema of the lung, but in some of whom at any rate acute dilatation of the ventricles of the heart takes place, and with it œdema of the lungs and sudden death. In other cases the serous cavities become full, in conjunction with extreme anasarca—a state of things more usually present in the more chronic cases. Ascites may be present at any time, and is not necessarily of serious omen in acute cases, provided that the pleura and pericardium remain free.

I have seen other cases where, in the second or third week of perhaps quite a mild attack of scarlatina, hæmaturia—not necessarily extensive—has set in, and the urine has gradually diminished in quantity, up to almost complete suppression; this without any dropsy, and with, in fact, no other signs distinctive of the disease. On the contrary, in all there has been a small, feeble pulse, a distant and feeble first sound, and they have died by asthenia. I have once or twice been tempted into giving a hopeful prognosis in such cases, and have had to regret it afterwards. Sir William Broadbent * has alluded to the ominousness—excluding lardaceous disease—of nephritis with low arterial tension, and I have seen, both in children and adults, some striking examples of the truth of this.

On the other hand, the nephritis may commence insidiously, without any of the symptoms indicative of acute disease, and of course therefore without anasarca. Such cases are, however, rare in comparison with scarlatinal dropsy.

In hospital practice, yet another condition must be mentioned as the most largely prevailing of all—viz., where children are brought for dropsy, many weeks after some indefinite attack of illness which we can only suppose has been scarlatina. "A retrospective diagnosis is often possible in these cases from the peculiar appearance of the fingers and toes. Desquamation continues here long after it has ceased in other parts of the body, and they present a smooth and shiny surface as if smeared with oil" (Starr). In these cases also the onset of the renal affection is probably insidious. No history can be given of any striking alterations in the character of the urine at any time, and with considerable albuminuria there is usually free diuresis and little alteration of the colour of the urine. In these cases the prognosis must be cautious.

Dropsy without Albuminuria.—Meigs and Pepper state that they have never met with dropsy after scarlatina in which they did not find albuminuria. Most writers, however, allude to a condition of what, for the sake of distinguishing it, we may call "simple anasarca," and it is not uncommon.

The first case that came under my own notice was in the Evelina Hospital in 1869—a boy of four, under Dr. Hilton Fagge. There was no history of scarlatina, but he had been suddenly attacked when in good health a fortnight before with frequently recurring vomiting. He had been dropsical for four days, and when admitted was suffering from general anasarca, ascites, and some fluid in one pleura. The urine was 1·007 and contained no albumin. The anasarca gradually disappeared without any albuminuria. Since then I have seen several less pronounced cases, mostly in the out-patient room, and another extreme case has been under my care in the Evelina Hospital, of which the following are the notes :

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* "Croonian Lectures on the Pulse," 1887.

A girl, aged three and a half years; scarlatina two months ago; ill a fortnight, but not kept in bed. Dropsy of the legs began a month ago. When admitted the child was remarkably dropsical, the whole of the subcutaneous tissue being affected. The feet were blue and greatly swollen. She was in a collapsed condition. There was no desquamation. A small quantity of urine obtained contained no albumin. She was at once put into a wet pack. This produced no perspiration, and she passed very little urine. The first sound of the heart was reduplicated, and there was a slight apex murmur. The œdema rapidly subsided, and at the end of three weeks had entirely disappeared. The urine was repeatedly examined, and, though scanty for the first two days, it never contained any albumin or any abnormal microscopical elements. The temperature was normal throughout. The treatment consisted of a milk diet, the wet pack, and an occasional jalap purge. Subsequently perchloride of iron was given for the anæmia.*

Steiner † writes of this affection thus :—"Frerichs has described a rare form of dropsy, without any disease of the kidneys, occurring after scarlatina,‡ which he believes to be due to paralysis of the cutaneous nerves by exposure to cold during desquamation, and I have lately seen one such case where repeated examination of the urine revealed no change, whilst there was very acute dropsy of the skin without any effusion into the cavities, which lasted twelve days." Thomas § alludes to epidemics in which all the dropsical patients were free from albuminuria. Hillier || suggests that the slight œdema, with which he alone has met, may be due to anæmia, which is often very great, and induced with great rapidity. Latterly, Sir Dyce Duckworth has published a well-marked instance of this affection, and it seems not unlikely from this and other cases

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* The cases are recorded, with some additional remarks, in the *Guy's Hospital Reports*, vol. xlii. p. 197.

† "Diseases of Children," Eng. ed. p. 341.

‡ I have lately seen two other cases, one in an infant a few months old, the other in a boy of two or three; each ran a similar clinical course, but there was no reason to suppose that scarlatina had anything to do with either.

§ Ziemssen's "Cycl.," Amer. ed., vol. ii. p. 259.

|| "Diseases of Children," p. 305.

that the dropsy is related to suppression of the urine, which was a very marked feature of my own cases and also in that published by Sir Dyce Duckworth.

Serous Inflammations are not uncommon after scarlatina, and they are liable to be of a suppurative form. Empyema is the most common, but suppurative pericarditis and peritonitis have both been known to occur. Endocarditis, meningitis, and inflammation of the joints must also be mentioned; the two latter, however, cannot be dissociated from the rheumatic affection, which will be considered immediately. An acute empyema may possibly prove fatal; the pus being often thin, rapidly formed, and attended with severe constitutional disturbance; but, as a general rule, purulent effusions do well.

Glandular Abscesses in the neck are very common. In young children they are apt to be associated with a diffuse inflammation of the cellular tissue of the neck, and sometimes with extensive sloughing of the skin. In other cases there is a diffuse brawny infiltration of the tissues of the neck, rather than any definite glandular affection. In either case the complication is a serious one. When the abscess is circumscribed and confined to one gland or so, there is not necessarily any ground for alarm. In some cases the abscess is retro-pharyngeal.

Diphtheria has already been mentioned as a *complication;* it is usually fatal as such, but it occasionally occurs later, with equally disastrous issue, either by extending to the larynx or by the exhaustion of the recurrent fever.

Otitis is very common. The inflammation may be limited to the external passage, or spread up to the middle ear by the Eustachian tube from the disease in the pharynx. In the latter case particularly—and in any case, if the discharge is of long continuance—disease of the bone is apt to arise, and either permanent deafness or worse happens.

Rheumatism.—Of late years scarlatinal rheumatism has been much talked about. It is a common sequela; occurring sometimes during the eruptive stage, but more commonly towards the end of the second week or later. It is quite like acute rheumatism, as we know it in childhood, from other causes, and shows itself, sometimes by pains only, more or less manifest, sometimes by swelling of the larger joints. Steiner states that it affects the knee and elbow by preference, but I have more often seen the wrists and ankles affected. It is attended by pericarditis rarely; by endocarditis commonly; or rather it is frequently associated with a systolic murmur at the apex of the heart, but in many cases this bruit disappears. Probably about 5 per cent. of the cases of scarlatina develop a murmur, but the majority of such bruits disappear within a short time. The relation of this affection to acute rheumatism is still uncertain. Henoch discards the term "rheumatism," and proposes that the affection shall be called "scarlatinal synovitis"; but I have seen many cases in which there was a strong family history of acute rheumatism—so often so, that I have come to think that this constitutional trait allows of the development of true rheumatism under the circumstances of the deteriorated nutrition engendered by the scarlatinal poison. Dr. Ashby, of Manchester, agrees with Henoch in holding that the larger number of cases are not of rheumatic origin. He thinks them mostly septic: because scarlatinal synovitis is more common in some epidemics than in others; it is essentially a complication of the prolonged febrile stage of severe throat affection; the attack usually supervenes at the end of the first week; fewer joints are affected; a relapse rarely occurs; and because endocarditis is very rare. Ashby admits the frequency of bruits both at the apex and left base, but he considers them all hæmic or functional.* We may add that, even supposing endocarditis to occur in 5 per cent. of the cases, this proportion would be very different from that seen in true articular rheumatism; in fifty consecutive cases admitted to the Hospital for Sick Children, Great Ormond Street, with ordinary articular rheumatism, thirty-seven had signs of endocarditis.

It occasionally happens that this scarlatinal synovitis runs on to suppuration and destruction of the joint, with symptoms of pyæmia. Such cases have justifiably tended to throw doubt upon other scarlatinal affections of the joints, it having been thought that the pyæmia of the one might be present in milder form in the serous inflammation of the other. But the suppurative inflammation is so rare that the two forms of joint disease may well be due to distinct causes.

There are other sequelæ which occur less often—such as pneumonia and bronchitis, chronic enlargement of the tonsils, wryneck (of which I have notes of two cases), and chronic diarrhœa. Lastly, may be mentioned as not uncommon, a chronic inflammatory condition of the mucous membrane of the nose and mouth, in which the surface of the nose becomes excoriated, encrusted with dry crusts, and exudes a thin discharge, whilst the mouth is superficially ulcerated and dotted with thin membranous patches, as in other forms of stomatitis.

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* "On the Affections of the Joints which complicate or follow Scarlet Fever," *Brit. Med. Journ.*, 1886, vol. i. p. 970.

Etiology.—It is a disease which spreads by infection, and is communicated by means of the exhalations and secretions, and also by the scurf from the desquamating skin. But little infectious, perhaps not at all so, during the stage of incubation, the risk rises during the eruptive and reaches its height in the desquamative stage. Such at any rate has been the orthodox view in the past, but recently some doubt has been thrown upon the infectivity of the desquamative stage. It is suggested that such infection as occurs in this stage arises, not from the peeling, but from the presence of discharges from the nose and ears, and that in the absence of such discharge a child who is peeling may mix freely with other children without risk of spreading infection. From the Southampton Fever Hospital in one year 204 persons were discharged still desquamating; only two of these gave rise to any infection, and one of these two was found to have developed a discharge from the nose after leaving hospital. But all these cases had shown no complications, and moreover had been rigorously treated with daily baths and daily syringing of nose, throat and ears with disinfectants for many days before leaving hospital; so that although these facts may point, as Mr. Lauder,* who records them, thinks, very strongly to the non-infectiousness of the desquamation, they hardly justify discontinuance of isolation until several weeks have elapsed since the eruptive stage; for the possibility of nasal or aural discharge developing must be excluded with reasonable certainty, and thorough disinfection of the naso-pharynx must be carried out, if it be the case, as Mr. Lauder suggests, that infection hangs about these parts with special tenacity.

Doubts have been expressed by many whether scarlet fever may not arise *de novo*, but as it is endemic and widely spread, and is even not unknown in domesticated animals, such as horses, dogs, and cats, in no case can it be said that infection is impossible, and consequently there is but little use in discussing a question upon which doubt is dangerous. Further, the germs of scarlatina appear to retain their vitality for long periods, and cases are on record where a fresh outbreak of the disease has occurred months and even so long as a year after a former one, owing to the housing and subsequent use of improperly disinfected clothes. The poison can in this way be carried for long distances by such things as letters or books, and in this respect it differs from measles and other exanthems. It can also be conveyed by articles of diet. Of late years outbreaks have been traced unmistakably to the contamination of milk. The poison has been shown to be effectually destroyed by exposure to a heat of 212°, from which it follows that all clothes, woollen or linen stuffs—everything in fact, that can be so treated, that has been in contact with scarlatinal patients—should be boiled or subjected to a somewhat higher dry heat (250°) for some hours before they can be considered to be disinfected. The poison is further possessed of extreme tenacity, and for this reason there is often great difficulty in efficiently disinfecting houses or rooms, and the fever breaks out again and again after what has seemed to be the most thorough disinfection.

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* *Lancet*, March 12, 1904.

Upon these considerations depends the answer to the question, when may a child who has had scarlatina mix with other children? Not until desquamation is over, and six weeks is about the usual length of the necessary quarantine, provided that the child has been carefully tended with reference to this matter. Desquamation will linger for two or three months if not hastened by proper attention to the cleansing of the skin. I must confess, however, to thinking it advisable to act with perhaps exaggerated caution in such matters. It is often a question of sending a child back to school, where it comes into close contact with perhaps a large number of healthy children, and where contagion, if conveyed, will be most disastrous. It is much better in such a case that the one child should suffer the, after all, but slight loss entailed by an extended holiday, than that any risk should be run by the many; and I would not hesitate to extend such partial quarantine to two, yes, even in some cases, three months. The medical man has to certify to the clean bill, and upon him lies all the responsibility. He need indeed be cautious, considering the facts which have been proved against scarlatina. Ten days is sufficient isolation for a child who has been in contact with scarlatina, provided that he and his clothes have been disinfected. No child must go to school or mix with those of other families while scarlatina is in his own home.

Morbid Anatomy.—Of morbid changes there are none sufficiently constant to make them pathognomonic. Micrococci have been discovered in the blood, and in the suppurative lesions streptococci may be found in pure growth, but their presence is probably to be regarded as an epiphenomenon, comparable to the streptococcal infection which sometimes accompanies diphtheria; and it is probable that we are on the eve of more positive information in this direction. All the known facts point to a particulate contagium, although we cannot yet identify it.

Of macroscopic changes we may expect to find, during the height of the fever, perhaps some mottling of the skin, œdema of the fauces, with livid congestion or ulceration; perhaps suppuration of the tonsils. The lymphatic glands in the neck are swollen, as also may be the mesenteric and other glands of the body. The cervical glands may be suppurating, or in severe cases are embedded in a diffuse œdema. Thomas alludes even to extravasation of blood around them as a result of intense inflammation. There is really nothing to note elsewhere. The bronchial tubes have been found injected, and the spleen is at times swollen, but this organ is by no means so frequently affected as in typhoid fever.

Microscopically various changes have been found. Fenwick has noted an infiltration of the rete mucosum with leucocytes; and to some active processes of cell growth of this kind set up by the fever must be attributed the later symptoms of desquamation. Klein has found that minute changes go on in the viscera, particularly in the kidney, spleen, liver, and lymphatic glands. Some of these—for example, the hyaline degeneration of the intima of the small arteries, and the cloudy swelling of the parenchyma of the liver and kidney—may be no more than the conditions dependent upon the febrile state, for they have been found by several observers in pyrexial states other than scarlatina; but it is important to note that, in addition to these, Dr. Klein has found in the early days of scarlatina (within the first week) that there is a hyaline change in the Malpighian tufts of the kidney; that the epithelium of the capsule shows signs of disturbed function by proliferation; and that the muscle nuclei of the small arteries undergo similar changes. Further, when the disease extends on to the tenth day, there then appears an extensive accumulation of leucocytes in the connective tissue around the renal vessels and tubes. Thus we have anatomical evidence, within the first week, of the action of the scarlatinal poison upon the kidney. The changes, indeed, are very similar in kind to those that have been detected in the skin. The risk of nephritis is thus clearly indicated, and the warning given to watch, and take care of, the organ concerned. In this stage there will be little or nothing morbid in the general appearance of the kidney; it may perhaps be over-full of blood, but no conclusion can be drawn from that. The later stages of scarlatinal nephritis show to the naked eye enlargement or swelling of the kidney, and there is increased resistance when it is handled or cut. The surface becomes mottled from the admixture of the natural colour with patches of opaque yellow or buff, and, more closely examined, the surface is seen to be speckled with minute yellow dots, and the section is muddled from loss of the natural streaky arrangement of the alternating vascular and tubal areas. The amount of this yellow or buff material varies much, and with it the appearance of the kidney. When extreme, the aspect will be that of the large white kidney, but, so far as I have seen, it is not often that such is the case. In children there may be very advanced changes in the kidney, with but little pronounced departure from the natural appearances. The kidney may be rather paler than natural; perhaps a more buff tint, as to which however there would be a doubt had we no clinical evidence, and no microscopic examination to help us. Microscopically, however, the changes are fairly constant. There are the appearances of glomerular nephritis. These are such as have been enumerated above, but in addition we find extravasation of blood or fibrinous material into the capsule, with more marked epithelial proliferation of the lining of the capsule and of the tuft itself; the tuft is either turgid with blood, or pressed back to one side of the capsule by the extravasation; and there are hyaline thickenings of the capsule, and periglomerular collections of leucocytes. In addition to all these the renal tubules are choked with cloudy or fatty epithelium; there are peri-vascular aggregations of inflammatory products in parts other than the capsules; local patches of congestion, with the vessels crowded with blood; and casts in some or other of the tubes, composed sometimes of blood, sometimes of fibrinous material. It is the more or less of this change and of that, at one time or another, which makes up the variety of pattern and gives perplexity to the student, so that it is necessary to insist upon the fact that a very bad kidney may not reveal itself decisively to the naked eye.

The morbid changes in the viscera associated with renal disease are not special to childhood, and need but a passing mention, with perhaps one exception—viz., dilatation of the heart. It is usual to find both ascites and hydrothorax in death from scarlatinal dropsy, whilst the lungs are small, of a dull leaden hue—their bases being solid from an œdematous pneumonia, and the upper part deficient in air—and with a copious frothy fluid exuding on pressure. This is the condition called **acute œdema,** that we know so well towards the end of a case of chronic parenchymatous nephritis. There is very likely to be double pleurisy in addition, perhaps pericarditis or endocarditis. But it has not been very generally recognised that the ventricles are liable to be dilated. Dilatation of the heart is recognised as an occasional result of scarlatinal poison or of the fever engendered by it, but it is not this to which I am now alluding. It is more important to impress upon the student that **acute dilatation of the heart** is not uncommon as the result of scarlatinal nephritis. It is, indeed, a common result of *chronic* nephritis in adults; but, whilst adults probably but seldom die from *acute* cardiac dilatation in *acute* renal disease, children are liable to die quite suddenly. In this, perhaps, may be found the explanation of a difference which, as I believe, exists in renal disease between the pulse of children and of adults. The hard pulse of chronic renal disease in adults is well recognised, and obviously it is the combined result of two factors—obstruction at the periphery (in the capillaries or small arteries), and compensatory muscular action on the part of the heart. The power of cardiac compensation is most striking in adults; it is less evident in childhood; and therefore acute dilatation of the heart must be watched for and guarded against. I have once seen diffuse suppuration in the wall of the heart in scarlatinal nephritis. It occurred in a girl of three and a half years, thirty-one days after the onset of the fever.* Such a case is perhaps of more value in emphasising the tendency that exists in scarlatina and its sequelæ to changes in the muscular wall of the heart, than in itself it would otherwise be. A rare occurrence of this kind can be the experience of but few.

To dilatation of the heart must also be attributed some of the cases of hemiplegia which occur after scarlatina; but, these being common, most writers mention their occurrence. Some such cases are due, no doubt, to dislodgment of clots from the inflamed valves, others from thrombi in the trabecular pouches of a dilated ventricle.

Of other morbid changes which are more or less prone to associate themselves with the post-scarlatinal state, there remain to be mentioned empyema, suppurative peritonitis, suppuration in one or other of the joints, suppuration in the middle ear with disease of the petrous portion of the temporal bone, periostitis and necrosis of the long bones, sloughing of the glands of the neck and the superficial skin, cancrum oris and broncho-pneumonia. Even this list might be extended, but without any great advantage, for all these are but occasional occurrences, although, when scarlatina claims so many victims, during the year, they can hardly be said to be uncommon.

Diagnosis.—When in doubt admit it, and act on the assumption that the disease is scarlatina. Rötheln, roseola, bastard measles, German measles, and all such terms are of bad reputation, and are only to be admitted when the evidence is indisputable that the attack is not scarlatina. There may often be a doubt, but the public should have the benefit, not the patient. Scarlatina may be mistaken for measles when the latter is more diffused and less raised than usual, or when the scarlatina is less diffused and more livid than usual; a scarlatina-like rash sometimes precedes the eruptions both of measles and variola—the latter by no means uncommonly, but variola is hardly one of the diseases of children. The lividity and elevation of the spots are to be attended to in addition to the coryza which is so characteristic of measles.

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* *Path. Soc. Trans.*, vol. xxxi. p. 70.

Rötheln is characterised by a rash which is at one time more like scarlatina, at another like that of measles. At one time there is much coryza and angina, at another none; and of individual cases it may be impossible to speak decidedly. But it occurs in epidemics, has usually more or less glandular swelling, not of scarlatinal type, and runs a short, sharp course without much illness, without desquamation, and without sequelæ.

Soap enemata are occasionally followed by a rash which may be indistinguishable from scarlet fever; but the sore throat, the thickly furred tongue with its bright red papillæ, the raised temperature, and usually the headache and vomiting are absent; and there are, moreover, in some cases minute differences in the rash which raise a suspicion that we are not dealing with scarlet fever.

It is not uncommon, especially in young children, for a bright red flush to appear on the face and upper part of the chest after crying, and in many children, when wrapped round with a blanket next to the skin, the whole body becomes deeply flushed. The evanescent character of the erythema in these cases should suffice for their recognition, but mistakes have been made, and we have even known the temporary condition of blushing to be mistaken for scarlet fever.

Tonsillitis is usually one-sided and limited to the tonsil. The glands at the angle of the jaw are all but quiescent. There is no preceding vomiting, the attack is sporadic, acute upon some chronic enlargement. Roseola, if it can be distinguished, is of a lighter tint; more diffused, less papular-looking, and may be traced to food or drink. Dr. Gee mentions that the swelling of the joints which sometimes occurs in scarlatina *before the outbreak of the eruption* has been mistaken for rheumatism.

Prognosis.—An attack *ushered in* by convulsions is nearly always fatal, and severe delirium is also a symptom of great gravity. Other symptoms of bad omen are excessive pyrexia, nasal discharge, evidences of failing circulation—lividity of the surface, excessive rapidity and feebleness of the pulse—diarrhœa, and any tendency to exhaustion, such as sordes about the mouth, membrane on the fauces, severe sweating, &c.

Treatment.—Scarlatina when uncomplicated and mild requires no treatment during the eruptive stage except confinement to bed, the substitution of fluid diet for that of ordinary health, and a mild aperient every other day or so. The room is to be well ventilated, kept at a uniform temperature of 65°, and the bed and body-linen changed frequently. Nevertheless, it is with mild cases that there is often so much trouble. Perhaps a child is hardly ill, and the parents do not see the necessity of, and the doctor does not insist upon, three weeks in bed. It is allowed to get up, perhaps to go out of its room, and then dropsy supervenes. Dropsy, no doubt, varies in its frequency in different epidemics, but this need not qualify the statement that it may be averted in many a case by timely care. Three weeks at least in bed, and a further fortnight or three weeks in one room, make the proper preventive treatment for this complication.

If the eruption is full out and the fever high, a warm bath night and morning will give much relief. When the fever is excessive, tepid sponging, the cool bath as described under the head of Measles, or the wet pack must be resorted to. For the soreness of throat, an electuary of equal parts of the glycerinum boracis and honey may be given in small quantities at frequent intervals.

Inunction is advisable in most cases as soon as the eruption appears. It relieves the stiffness and itching of the skin, it stimulates the circulation, is agreeable to the patient, and promotes sleep, and thus indirectly tends to better the disease. Carbolic oil 1 in 40 is a very good preparation, possessing as it does disinfecting properties. Meigs and Pepper recommend cold cream, to which a drachm of glycerine per ounce has been added—a very nice preparation, which may easily be made mildly disinfectant by substituting the glycerinum boracis for the pure glycerine. The inunction may be applied as often as necessary—two, or three, or more times a day.

I may insist the more upon antiseptic inunction because some very strong evidence of its value has been adduced by Dr. Jamieson of Edinburgh. He asserts that he has by this means completely prevented the spread of infection from the sick to the healthy. From the first onset of the fever the patient is anointed from head to foot (including hair), morning and evening, with the following ointment:

Carbolic acid	grs. xxx.
Thymol	grs. x.
Vaseline	ʒj.
Simple ointment	℥j.

A hot bath is given every night, and the fauces are painted frequently with glycerine of boric acid. During three years trial of this plan of treatment Dr. Jamieson has never known the infection to spread.

If not resorted to before, a daily warm bath should be commenced as soon as desquamation begins. Plenty of soap and water and friction hasten the completion of this stage. Care must, of course, be exercised to avoid any chill, but this can readily be done by having a bath at 100°, and a large warm towel or sheet to envelop the body during the process of drying, in which the child may be carried back to bed. In the more severe cases the temperature will probably be higher, and the cooling processes a more important element in the treatment. Cold sponging, the tepid bath, or the ice-pack must be resorted to more freely; and in cases where there is much delirium an ice-cap may be applied to the head with advantage. These are cases where much depends on feeding. The throat is sore, and the child refuses food in any shape. It must be coaxed with all the variety the nurse or physician can suggest. Barley-water, with uncooked white of egg added to it; simple water and egg albumin; nutrient jellies, blanc-manges, chicken broth, veal broth, Brand's essence, milk, junket, whey, all readily suggest themselves as valuable in turn. To these must be added stimulants, either brandy, champagne, or port-wine. When food by the mouth fails, nutrient enemata or suppositories must be tried; but, as I have already said, enemata are not well tolerated by children. I am disposed to think more highly of the catheter passed through the nose into the stomach, and of regular feeding conducted through it. As regards local treatment, when the faucial inflammation is severe, there is much difference of opinion. Meigs and Pepper think that the good that might accrue is often nullified by the exhaustion produced in the struggles of resistance. But there can be no doubt that, when it can be applied, some glycerine preparation sometimes gives such relief that children will often submit readily to its reapplication. I am not prepared to say dogmatically that one preparation is better than another. Personally, I am in favour of boric acid and glycerine, or that in combination with bicarbonate of soda—at any rate, whenever there is any tendency to the closing of the fauces by viscid mucus or the formation of membrane; but others are equally fond of perchloride of iron and glycerine, or chlorate of potash, &c. The inhalation of steam, impregnated with carbolic acid, eucalyptus oil, or terebene, is always advisable. And a spray of liquor calcis and the sucking of ice are both well worth a trial in suitable cases.

Internally, perchloride of iron, chlorate of potash, carbonate of ammonia, and quinine are the most serviceable drugs, when drugs are needed. The chlorate of potash may be given in three or four grain doses with five or six drops of hydrochloric acid and a little syrup of tolu, &c. This is useful in adynamia, or when the throat is much affected. Carbonate of ammonia is also a valuable stimulant in severe cases, two or three grains being given in milk every three or four hours. Quinine should be given if the temperature keep up beyond four or five days.

Of drugs for cutting short the exanthem, none have as yet any claim to trust. Belladonna has been tried and abandoned. Hyposulphite of soda in five-grain doses, and sulphocarbolate of soda are thought well of by some, and salicin also when there is much fever.

Dr. Illingworth, and Dr. Dukes of Rugby, have spoken very highly of the biniodide of mercury, both in respect of its power to cut short the disease and also to influence for good the scarlatinal nephritis. Children take the solution of the perchloride of mercury well, and to it in doses of 15–30 minims may be added some iodide of potassium, 1, 2, or 3 grains, as may be considered advisable. Dr. Illingworth also strongly recommends the biniodide in suspension as a paint to the throat. He takes two ounces of the solution of perchloride of mercury, and adds gradually a solution of 1 in 4 of iodide of potassium or sodium until a cloudy red liquid is obtained. To this is added half an ounce of glycerine for the purpose of suspension.

The complications and sequelæ of scarlatina, excepting the nephritis, must be treated each of them on its own merits; but this general rule will apply, that, resulting from *fever*, they are generally an indication of the need for stimulants and tonics.

In scarlatinal dropsy, the child—if not already in bed—must be at once sent there. The diet is to be fluid, the bowels are to be regularly opened by jalapin (gr. j) or scammony (grs. v to vij) or seidlitz powder once a day, and the skin is to be acted upon by a warm bath night and morning. The bath should be 100°. The child should be immersed up to its chin, and allowed to remain in it for fifteen or twenty minutes, care being taken to keep up the temperature of the water the while. It is then to be wrapped in a dry warm sheet and put to bed again. Should these measures not be successful, dry cupping to the lumbar region may be added, and frequent hot applications by means of spongio-piline. Digitalis should be given internally for two purposes—first, to keep up the flow of urine, and, secondly, to guard against the occurrence of dilatation of the heart. The tincture may be given with the liq. ammon. acetatis, or by itself in two-, four-, or five-minim doses every two or three hours, but I prefer to give it with citrate of potash in quantity sufficient to make and keep the urine alkaline, in this respect following Sir William Roberts of Manchester. The quantity of the potash salt must be fixed for the case; it may be any quantity from five grains every three or four hours upwards. Ten or fifteen minims of the infusion of digitalis every three hours are sometimes more successful than the tincture. The tincture of strophanthus will also prove useful as, in addition to its action upon the heart, it certainly has a very striking diuretic action in some cases.

Should there be any tendency to suppression of urine, and should convulsions threaten, immediate and repeated resort must be had to all these means. Purgation must be free, and bromide and iodide of potassium should be given internally. Diuretics are recommended by many, and copious libations of whey or milk-and-water are of great use; but for the rest, with the exception of the digitalis or strophanthus already mentioned, I prefer to trust to the action of bowels and skin rather than run the risk of further blocking an organ already at a standstill from hyperæmic conditions. In this condition a warm wet pack—by means of a blanket wrung out of hot water—for two or three hours at a time, is very useful, and in bad cases I have used subcutaneous injections of pilocarpin ($\frac{1}{16}$ gr. to $\frac{1}{12}$ gr. or more), though not with any striking success. The temperature of the child must be watched while the pack is in progress, for the treatment is not always the harmless remedy it appears to be. The temperature sometimes runs up rapidly under its employment, necessitating its immediate discontinuance.*

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* See Dr. G. Carpenter, *Practitioner*, 1888; also Keating's "Cyclopæd. Diseases of Children," 1890, vol. iii. p. 550.

When the acute symptoms subside—the dropsy diminishing and diuresis becoming established—then is the time for iron. Tincture of the perchloride is useful; with it the albumin may decrease, the blood disappear, and the anæmia become much less manifest. A combination of sulphate of iron with magnesium sulphate is sometimes preferable as being less likely to cause constipation. Sometimes milder preparations are required. If so, then reduced iron, carbonate of iron, the liquor ferri dialysatus, or Parrish's food may be resorted to.

The kidney is not an organ that repairs quickly; consequently, if the albuminuria is of any duration, the child must be kept in bed for some weeks. When the albumin has disappeared there is still need for much caution. The clothing must be very warm—flannel next to the skin—and the diet must be the most assimilable possible. It should consist largely of milk for a long time. Open-air exercise is to be resorted to gradually, and only at first on the warmest days. And if the parents are in a position to allow of it, a temporary sojourn at some mild watering-place, such as Torquay or Penzance, is very desirable.

Scarlatinal rheumatism is to be treated by salicin or salicylate of soda, but to young children the salicylate should be given with caution. I have known severe vomiting and collapse to be produced by it. Perhaps a grain for each year of life may be considered an adequate dose with which to commence. It may be given every three or four hours till the pain is relieved; and then at less frequent intervals, and subsequently combined with quinine.

For the otorrhœa boric acid may be blown into the ear, or the ear gently syringed with warm spirit (ʒss to ℥x) three or four times a day. After syringing, a little oil (F. 40) should be dropped into the ear, and some salicylic wool kept in the meatus.

When there is a discharge from the nose, it is advisable to paint the inside of the affected nostril with the glycerinum boracis, or an ointment of fifteen grains of iodoform or iodol, half an ounce of the oil of eucalyptus, and vaseline to an ounce and a half, or the nostrils may be syringed with a solution of glycerine of borax, ʒj in an ounce of water, or Listerine (1 in 4) may be used.

Preventive Treatment.—No doubt in the future we shall have adequate hospital accommodation for fever patients and homes for those who are convalescent; at present, when out of reach of these means,* we must come as near as may be to the sanitary requirements of the day. The child must be kept in the one room, its nurse or nurses occupying another on the same floor. All unnecessary stuffs and linen, carpets, &c., are to be removed from that floor. Sheets steeped in carbolic acid are to be hung from the doors of the rooms, and a similar material is to be sprinkled freely over the floor. No actual contact is to be allowed with the rest of the household, and all linen from the sick-room is to be steeped in some disinfectant before removal. This quarantine must be rigidly enforced, and maintained throughout the illness—that is to say, until desquamation is completed—an irksome and difficult task enough, and one which it may be hoped may be considerably mitigated in the future should the careful trial of Dr. Jamieson's method of disinfection prove as beneficial as its advocates claim it to be. When the term of quarantine has expired, the child should have a final bath, leave all his clothes behind him, and don a clean outfit outside his room.

After the exit of the patient and his nurses, the rooms occupied by them must undergo a thorough disinfection. Sulphur should be burned in them for some hours, the papers stripped, the ceiling rewhitened, the floors scrubbed with carbolic soap, and all bedding and linen which cannot be subjected to prolonged boiling must be sent to some disinfecting oven and subjected to a prolonged heating of 250°. Clothing must be treated in like manner, and, where expense is no object, everything in the way of cloth or wool that has been contaminated should be burnt.

When a case of scarlatina breaks out in a school, it is a good plan when possible to have the temperature of all the children taken night and morning. A quarantine ward should be prepared, well provided with carbolic vapour, to which all cases of sore throat or pyrexia should be at once removed. By these means very early isolation can be effected, and there is every chance of arresting the spread of the disease.

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* At present the Mary Wardell Convalescent Home at Brockley Hill, Stanmore, Middlesex, is the only one for the convalescing stage accessible to those who live in London or its suburbs, and the Fever Hospital at Islington for the eruptive stage amongst the upper classes.

CHAPTER XIV.

RÖTHELN—ROSEOLA.

Rötheln (Epidemic Roseola; Bastard Measles; German Measles; Rubella) is an affection which appears to have been noticed at various times in the last hundred years; but many, even yet, have seen little or nothing of it, and doubt its existence. There is not, however, any longer room for doubt that an exanthem is occasionally present with us which in some things resembles scarlatina, but, in more, measles. Originally it was thought by many to be a hybrid between scarlatina and measles; now it is commonly supposed to be a distinct species. But the one opinion does not exclude the other; there are, *e.g.*, some who think that diphtheria—from certain peculiarities in its history and associations—is a disease in which the germ of what will be, but is not yet, a distinct species is in process of evolving; that it is in fact an illustration of the tendency which plants exhibit of varying under domestication—and, indeed, what can be more likely? We know that in the cultivation of plants variations occur, and that hybrids are grown which can occasionally be propagated so as to constitute them distinct species. Why should exanthem germs be—is it probable that they are? —altogether exempt from such tendencies to variation? Thus, when we have to do with a disease which is at one time more like scarlatina, at another like measles, but always to some extent like both, and always wanting some of the features of both, I see not only no difficulty in considering the disease a hybrid, or a derivative of one disease or the other, but also none in regarding it as a distinct, though perhaps as yet but an imperfectly stable species, and one which, regarding its probable source, is of the greatest possible etiological value. Naturally we must be very cautious in accepting any conclusions upon such a point. Eruptions very like scarlatina, very like measles, are undoubtedly produced by various articles of food, drugs, and so on. It will not do, therefore, to conclude, because of the existence of a nondescript rash, that some new exanthem has started into existence. I only wish to maintain that there is no inherent objection to this derivative view, and that, until we know more of the nature of the "germ," it will be as well to keep our minds open. But in thus stating dogmatically that the existence of a distinct exanthem which resembles two others, but is neither, is proved to demonstration, let me say, as I shall again do with regard to roseola, that the affection is relatively an uncommon one, and that the diagnosis is to be arrived at with the greatest possible circumspection. "German measles" is a term which is terribly abused. A doubtful rash makes its appearance, and the medical man, instead of saying he is not certain of its nature, calls it German measles. "Then it is not scarlatina?" ask the parents. "No," replies the doctor; and, thinking nothing of measles, they take no precautions. Any hospital physician sees many such cases, and knows also very well—considering the rarity of the actual disease—that, when he has to do with the results of what has been diagnosed as German measles, it is more probable than not that the nature of the malady was scarlatinal, and that in this direction he must look for the explanation of whatever sequelæ he may meet with.

As regards its specific entity, it may be pointed out that it occurs in epidemics; that one attack appears to be protective against a recurrence; and that it is no protection to have suffered previously from scarlatina and measles. Of sixty-three cases seen by Dr. Dukes, thirty-nine had had measles, twenty-three had not. If anything, it appears to be more common in adults, at any rate in young adults or adolescents—a class of whom a larger number are protected by previous attacks of scarlatina and measles than in younger children. Conversely, those who have suffered from rötheln procure no immunity from scarlatina or measles. I should add to this that Thomas states that it is especially a disease of childhood, attacking indiscriminately older and younger children down to sucklings, susceptibility being essentially weakened at puberty, and nearly lost after forty.

It is very contagious, though less so than measles. Dr. Dukes, however, no mean authority, considers it the most contagious in its early stages of all the exanthemata; and in an epidemic at Charterhouse, recorded * by Dr. Haig-Brown, in spite of the most active precautions as to isolation and disinfection, the disease spread from a first case to 202 others. The infective power is said to exist for a month, so that strictly a child should be isolated for that time. But the disease is one of so little severity, that, except in the case of weakly children, it can hardly be necessary to keep up any strict quarantine after ten or fourteen days. As a matter of practice, provided one is sure of the nature of the disease, there can be but little objection to allowing a child to return to school at the end of a fortnight,† if thorough disinfection has been carried out.

Definition.—A specific eruptive fever, the rash appearing during the first day of the illness. Beginning behind the ears and on the scalp and face in rose-red dots, or as rosy-red slightly raised patches, extending next day to the body and limbs, subsiding with the fever on the third day, and not preceded by catarrh. Slight branny desquamation on the face is not uncommon, and when, as is occasionally the case, the pyrexia is sharp, this may be pretty general over the body.

Incubation.—A fortnight or more, during which the child is quite free from symptoms. Dr. Dukes records thirty-six cases, in twenty-five of which the incubation is given; in one or two only was it twelve days, in the remainder fourteen up to twenty-two days. In seventy-five of Dr. Haig-Brown's cases it varied from seven to seventeen days, in sixty-six of them being from nine to fourteen days.

The **Eruptive Stage** may be well illustrated by a case: A lady who always enjoyed good health was quite well till May 20. She felt out of sorts and depressed all day, with lumps in her neck, and on May 21, in the early morning, an eruption appeared, and I saw her immediately. The temperature was then 98·6°, the pulse 80. The face and neck were covered with a red raised eruption, consisting of clustered papules rather thickly set, but the intervening skin being white and healthy-looking. There was no soreness of throat, but well-marked, rather hard, and not tender, enlargement of glands on both sides of the neck. She felt perfectly well. The next day the rash had become much more diffused, the face now presenting a livid appearance, with a general red ground and lumpy raised elevations upon it. Over the chest there was a roseola not unlike scarlatina, but less punctate. The temperature still remained normal. The next day she was well, and no desquamation followed.

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* *Brit. Med. Journal*, 1887, vol. i. p. 826.

† "A Code of Rules," *loc. cit.*, says two to three weeks.

Here we have all the characteristics well marked: twenty-four hours of the most moderate indisposition; the outbreak of an eruption like measles, though attended by a roseola not unlike scarlatina; the absence of catarrh, such as is characteristic of measles; the absence of desquamation, characteristic of scarlatina; considerable temporary swelling of the glands of the neck, but no sore throat, no fever at any time; and the affection running its entire course in four days.

Some latitude must be allowed both to the definition here given and to the type which is illustrated by the case. For instance, the eruption, though usually raised in coalescing points like measles, is occasionally diffused, and unquestionably more like scarlatina; and this practically has suggested to some that rötheln is a term applied to two distinct exanthems. Pyrexia may, or may not, be present: it is usually moderate when present; there may also be some slight catarrh, and occasionally there is some slight branny desquamation. But these features are present in only the minority of cases, and will then necessarily tend to obscure the diagnosis. Dr. Dukes describes a mild and a severe form. In the latter the eruption is profuse and the temperature up to 103°, and Dr. Haig-Brown records cases where it ran up to 105°. Complications and sequelæ there are none of any importance, so that if after an attack of German measles a child remains thin and feeble or has any discharge from its ears, these things indicate, to my mind, that some error in diagnosis has been made, and that the disease was either scarlatina or measles.

Diagnosis.—I have already said that it is easy to mistake rötheln for scarlatina and measles. Somewhat similar eruptions may be produced by drugs and food, and also by enemata, and Dr. Dukes mentions the frequent occurrence of a measly rash which is caused by handling some species of caterpillar—a very common hobby with boys at school. Great diagnostic value has been attached to the enlargement of the posterior cervical glands; it is a common symptom, but it is frequently absent.

Drs. Wilcocks and Carpenter have noticed it absent,* and Dr. Haig-Brown also, in the epidemic already quoted, eighty-four times to seventy-five in which it was present.

Treatment.—The child must be kept warm in one room, and in bed, if possible, for a day or two, but this is not absolutely necessary; some saline diaphoretic may be given, and any mild aperient that may be necessary. Here, as in any other exanthem, the clothing must be attended to after the attack, the child being kept warm and guarded from chills, and, should any debility show itself, an iron tonic should be given.

The room inhabited by the child during the attack must be fumigated afterwards as for other exanthems.

Roseola, or rose rash, has no strict right to be considered in association with the specific exanthemata; but the chief point of the affection is the difficulty of the diagnosis—a question of such moment as quite to justify the departure from any mere scientific arrangement. Rose rash is an irregular mottling or blush upon the skin, dependent apparently upon gastric disturbances. It wants the minute bright red punctiform appearance of scarlatina, and is sometimes more like measles in mottling the skin. It is generally diagnosed by the absence of any definite symptoms of scarlatina, and, experimentally, by the fact that it has not in any given case spread by contagion.

But let it be indelibly impressed upon the student that it is often very difficult to distinguish this complaint from scarlatina, and that a mistake may be followed by the gravest consequences. Many a case of rose rash has proved itself in the result to have been scarlatina. Therefore, unless there is no doubt, it is safer to take precautions as if the more serious disease were present. Rose rash stands in this respect with surgical scarlatina or membranous croup. There are scarlatina-like eruptions which are not scarlatina, and membranous inflammations of the larynx which are not diphtheritic, but the several diseases which in these respects so closely resemble each other can but seldom be distinguished. So-called simple croup too often shows itself in the issue to be diphtheria; therefore, for the safety of others, in default of conclusive evidence to the contrary, all should be so regarded. So, too, should it be with roseola, for scarlatina now stalks about as often as not in the garb of innocence, and does incalculable harm both to the patient and to those with whom he comes in contact. For instance, two children suffer from a red rash, called "rose rash" by the doctor, who commits himself positively to the non-scarlatinal nature of the affection. But subsequent observation shows that they have sore throat; a servant in the house has a bad throat; and an aunt in the same house also has a bad throat, and is unwell for some weeks. Of the patients themselves both subsequently have enlarged cervical glands and desquamation, and one has discharge from the ears and albuminuria. Another child has what is called "rose rash"; but it remains sickly afterwards, and has a discharge from its ears, and does not regain strength for some weeks. Now, inasmuch as roseola is a very transient and trifling matter, and is followed by no sequelæ, when a child remains weak and thin, with a red raw tongue, dry skin, and has a discharge from the ears after such an attack, it is probable that a mistake has been made in the diagnosis, and that scarlatina has been the disease. The above are both cases that actually occurred, and every one of us must have seen many more of a similar kind. A more careful examination of such cases, from this point of view, will often lead to the detection of a general fine branny desquamation, or some flakiness of the cuticle, on the hands and feet. Such children, I say, are abroad in numbers, wholesale purveyors of scarlatina; and they will continue to be so, so long as "rose rash" is a term of everyday application. Our attitude is not to ignore its possible existence, but to accept it only upon the strongest evidence; and the usually accepted evidence—viz., absence of pronounced symptoms of scarlatina—is not sufficiently exclusive, for there is no disease which is more variable both in the intensity of single symptoms and in the grouping of those which may be considered typical.

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* *Practitioner*, 1887.

Treatment.—When we are sure that we are dealing with roseola, very little treatment will be required. Some simple saline, such as citrate of potash with acetate of ammonia, and warmth in bed for twenty-four hours, with lighter diet for a day or two, will probably be all that is necessary.

CHAPTER XV.

DIPHTHERIA.

Diphtheria is a disease very frequent among children; it is most common between the ages of two and ten. It is usually considered to be due to a specific poison, because it is often epidemic and it is certainly contagious. But there are points in its natural history which differ much from many other specific fevers, and of these it may be mentioned that its contagious power is not a very high one. It is communicated by one patient to others by means of inoculation from a materies derived from the diseased parts, and thus doctors and nurses are frequent sufferers; an imperfectly disinfected tracheotomy tube may impart it; and a healthy child put into a bed or a particular corner of a room recently occupied by a diphtheritic child may thus "catch" the disease; but it is not communicated to other children or patients in a building who have had no contact with the sick, or carried about by third persons in clothing like measles or scarlatina. It may be conveyed by milk. Cats certainly, and possibly other domestic pets, are liable to diphtheria, and in some cases these may be the source of infection. It has also a curious tendency, much more frequent with it than with other specific fevers, though not unknown in them, of tacking itself on to some other fever. Thus, measles followed by diphtheria, scarlatina followed by diphtheria, typhoid fever followed by or going with diphtheria, are all well known and not uncommon. Epidemics of all these three—measles, scarlatina, and typhoid—occur in which diphtheria attacks many, so that some have thought it wanting in specificity and capable of being bred out of these diseases. Its relationship to scarlatina appears to be unusually close; but on this point it behoves us to be cautious in statement; for it has been shown by Dr. Washbourn and Dr. Goodall * that in many of the cases of scarlatina with membranous exudation on the fauces having a superficial resemblance to the diphtheritic membrane no proper bacillus can be cultivated, and this can now be determined by experiments within twenty-four or thirty-six hours in any doubtful case. Again, if membranous croup and diphtheria are one disease, as very many now hold, diphtheria is endemic, for sporadic cases are very common and appear to keep company in a large number of cases with no other known source of contagion than bad-smelling drains. There is indeed much to be said in favour of a pythogenic origin *de novo* in these cases. But defective drainage by no means explains altogether the propagation and spread of the disease. The investigations of Dr. Thorne Thorne go to prove, what has for a long time seemed to many to be probable, that *dampness* of soil and of dwellings is an important factor; and this curious feature of its life-history has also come out that it has obtained a hold upon large towns of late years such as it never had before, notwithstanding that the sanitary condition of all large towns in England has greatly improved. Diphtheria differs from other specific fevers in having no proper eruption attaching to it, being mostly without any at all; it is said sometimes to possess one of scarlatinal character, sometimes one like that of measles, more often perhaps an anomalous patchy roseola—in virulent cases the rash may be petechial. Lastly, unlike other specific affections, diphtheria has no powerful protective influence against another attack at some future time.

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* *Transactions Roy. Med.-Chir. Soc.* 1894.

Incubation.—This stage appears to be somewhat uncertain. It ranges from two to eight days—three days being a usual time to elapse between the reception of the germ and the first symptom.

The Eruptive Stage is characterised by the formation of tough yellowish or greyish membrane upon a mucous surface, generally of pharynx or larynx, combined with local inflammation. The local symptoms are associated with certain so-called constitutional symptoms—viz., fever and albuminous urine. Different cases vary in many respects. The *type* is pharyngeal diphtheria, but sometimes the membrane forms not upon the fauces, but on the conjunctiva or the labia pudendi, oftentimes in the larynx. Sometimes it in great measure confines itself to the nasal mucous membrane; sometimes it may be found upon the lips, sometimes on some sore upon the skin; sometimes no membrane is present, yet the remainder of the symptoms make the case indistinguishable from one of diphtheritic nature. So with the albuminuria. In some cases it is much and persistent; in others it is moderate in quantity throughout; in others it quickly disappears. The pyrexia, too, may be of all grades of intensity: sometimes so little that the child is able to sit up in its bed and play with its toys; sometimes the constitutional disturbance is so severe that the condition is desperate even from the commencement.

Pharyngeal Diphtheria.—The onset is usually somewhat leisurely; the child is out of sorts, heavy-eyed, languid, and pale, for four or five days, by which time the temperature reaches perhaps 101°. The throat is now seen to be red and swollen, and predominance of redness or lividity over swelling is of evil omen. The appearance of the throat in a simple tonsillitis is, usually speaking, a more juicy or œdematous one than the perhaps less swollen, but fleshy-looking, thickening of the parts in diphtheria, and the swelling is more often unilateral. The membrane begins as small patches of yellowish material, not in themselves distinguishable, or at any rate certainly so, unless perhaps occasionally by their dirty colour, from the plugs of welded epithelium and secretion which issue from the mouths of the follicles of the tonsils in the course of tonsillitis, both acute and chronic. Their nature has to be decided by their position —if they are on the soft palate, provided of course that we are not dealing with thrush, they are of membranous nature—by their roughness, by their extent, by the general appearance of the throat, by the constitutional symptoms, pain in swallowing, fever, and glandular swelling. At this time there will probably be fœtor of breath, and the glands beneath the angle of the lower jaw on one or both sides should be hard, tender, and slightly enlarged, but the swelling need not be much. In cases of severity it is often considerable.* The diphtheritic plaques tend to increase quickly in area, and to coalesce; they adhere rather stoutly to the surface of the palate or tonsil, and when removed a shallow ulcer is seen, with numerous bleeding-points upon it. The urine is usually of good colour, good specifi gravity, and a moderate cloud of albumin is precipitated if col nitric acid be added. It but seldom contains blood. Hyalin and epithelial casts may sometimes be found by microscopica examination of the urinary sediment.

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* I would insist particularly upon this *hardness* of the glands at the angle of the jaw in diphtheria, as it is often a most characteristic feature. I have lately seen an outbreak of the disease in a school where, with a few cases of pronounced diphtheria, a large number of the children suffered from a diffused fleshy thickening and ulceration of the tonsils and fauces, and in a great many of them the glandular hardening was striking. It may remain for some little time after the throat is apparently well. I think, too, that this feature is not without an etiological value when considered in conjunction with the fact noted on p. 235.

In a case of this kind terminating favourably, the membrane perhaps remains *in situ* for some three or four days, and then slowly disintegrates, disappearing in perhaps ten days from its first appearance, and the child slowly regains its former state of health. When the membrane clears away, a somewhat indolent, though shallow, ulcer is usually left behind, which is often slow in healing up, and is followed, or not, as the case may be, by paralysis of the soft palate. And this may be so even when the evidence of real illness has been but slight. In favourable cases the albuminuria disappears, sometimes with peculiar suddenness, in a few days, but it may last even in considerable quantity for some time after the subsidence of the throat symptoms.

The symptoms are liable to vary considerably in individual cases. There may be much membrane about the soft palate and fauces, very little constitutional disturbance, and no albuminuria—*e.g.*, a girl, aged ten years, had been ill for twelve days with sore throat. The urine contained no albumin at any time, the temperature only reached 99°, and she hardly seemed ill, yet the sides of the fauces were covered with membrane, her cough was croupy, and there was decided dyspnœa. She was treated with chlorate of potash, perchloride of iron internally, and a local application of bicarbonate of soda, and recovered. Again, the membrane may be considerable, the constitutional symptoms slight, but albuminuria considerable, and after a few days the child may die almost suddenly, either from collapse or sudden syncope. In others, the throat affection may be severe, the fauces, soft palate, and uvula being covered by thick leathery lymph, and some parts perhaps sloughing, in which case the

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that in this disease, perhaps alone of all the contagious febrile diseases, the spleen wants the pulpiness which is one of their chief characteristics. The spleen of diphtheria is almost always moderately firm, but I have not had the opportunity of examining many cases of the virulent pharyngeal form.

constitutional symptoms will almost certainly correspond in severity. The nasal mucous membrane is then liable to suffer, and an offensive serous acrid discharge issues from the nostrils and crusts about the anterior nares. In these cases the fever is likely to be high, the pulse rapid, the albuminuria copious, and the prostration and somnolence profound. In some, the throat symptoms may be slight, the fever severe, and the general symptoms those of bad blood-poisoning, death occurring within a day or two, or even less. In others, the fauces may show no membrane, but the tonsils and parts around are in a condition of acute phlegmonous inflammation. I have seen cases of this kind where the tonsils have been sloughing out *en masse*, and in which death has occurred by sudden failure of the heart. Laryngeal symptoms are paramount in some, or the disease may be entirely confined to the larynx, but there can be no doubt that in many of these cases called "croup" the early faucial inflammation has been overlooked from the insidious manner of onset peculiar to the disease. It sometimes happens, too, that the sore throat may be devoid of all specific character, the resulting malaise and anæmia perhaps more than is readily explicable; but the true nature of the disease is first proved by the onset of paralysis.

Causes of Death.—No case of diphtheria, however mild, is free from danger. The risks are chiefly four: (1) Of blood-poisoning. (2) Of some cardiac disturbance, leading—sometimes to slowing and irregularity, sometimes to rapidity and irregularity of the pulse. (3) Of asthenia. (4) Of extension of the membranous inflammation to the larynx, with all the consequences which this involves.

The last mentioned is, in hospital experience, much the more frequent, but perhaps this is only due to the fact that, as such cases require operative treatment and very special nursing, they are therefore more likely to be sent into a hospital. But to take the various risks in order. (1) Blood-poisoning carries off some. Cases of this kind are usually severe from the commencement—probably the throat symptoms are excessive; the nostrils involved; the membrane is plentiful, tough, and dark-coloured; the breath fœtid; the albumin copious; the temperature high; and the pulse rapid and feeble. Four or five days see the termination of such a case as this, and death comes either by somnolence, gradually deepening into coma, or more suddenly by a rapidly falling temperature, coldness of the extremities—perhaps profuse sweating—and a general lividity of the surface; a condition, in short, of septic collapse.

All acute inflammations about the fauces show a tendency to cause slowing and irregularity of the pulse; this is specially the case with diphtheria, and constitutes one of the great dangers of the disease. Moreover, the symptom is by no means confined to cases of severity, and the risk appears to attach not only to the acme of the disease, but to the period of convalescence afterwards. Cases are on record in which sudden syncope has ensued after all membrane had disappeared from the fauces, and the ulcers remaining were healing satisfactorily. The pulse will sink to 50, 40, or even less—Hillier says even so low as 20—per minute, and become irregular; this condition being associated perhaps with vomiting, and a temperature below normal, and the child is said to die quite suddenly. I once made an inspection of the body of a boy of four, under the care of my colleague, Sir Samuel Wilks, who had been ill six weeks, and had had paralytic symptoms for a fortnight. He was a thin anæmic boy, and appeared to die from exhaustion. The left ventricle of the heart was widely dilated, although the muscular tissue looked healthy. It may also be added that, in addition to this disordered innervation, the action of the heart may be exceedingly feeble from fatty degeneration of the muscular fibres of its wall. I have seen other cases where there was no special heart symptom except a very small pulse—children in whom an extreme pallor, restlessness, and resistance to all attempts to induce them to take food were the notable features of the cases. Such usually indicate a fatal termination.

So also does persistent vomiting, a symptom likely to be associated with much albuminuria and suppression of urine, but by no means always so. It is probably sometimes a symptom, concurrent with the heart failure, of a disturbance of function of the pneumogastric nerve. However and whenever it occurs, its significance is of the gravest. But the greater proportion of deaths is due to suffocation caused by the extension of the membrane from the fauces into the larynx and trachea, or by a more or less general broncho-pneumonia due to this, or to this and the operation of tracheotomy resorted to for the relief of the asphyxia. This also is a complication which is more likely to ensue in the cases of moderate severity than in those which run a more rapid course; and, as I have already said, it appears ofttimes to be the primary affection. But careful inquiry generally serves to show a period of four or five days malaise, and I have known laryngitis to follow pharyngeal diphtheria so late as the twelfth day. Some still doubt whether there is such a thing as an uncomplicated laryngeal diphtheria—that is to say, whether there is not in all cases some, even if it be but slight, faucial disease as well. Others, on the contrary, go so far as to say that whenever a membranous laryngitis is met with it is due to diphtheria; in other words, that membranous croup is always diphtheritic. If this be correct, the other opinion cannot be, as it is quite certain that a membranous laryngitis is met with in which the fauces are free from beginning to end. In these cases there is slight malaise for three or four days; then a noisy reedy cough is noticed, and slight inspiratory stridor. The temperature of the body is as yet hardly in excess, although even already the urine may be albuminous. The noisy hissing respiration increases, the temperature rises, the child becomes more and more restless, the features become livid and then leaden, and, unless the windpipe be opened, death ensues shortly from suffocation. The best gauge of laryngeal obstruction is the recession of the weaker parts of the **chest-walls** during inspiration;* that of a pressing deficiency of aeration is **restlessness**. A diminution of restlessness, accompanied by the onset of a leaden or ashy pallor of the features, betokens impending dissolution and the immediate necessity for tracheotomy.

Complications and Sequelæ.—These are not numerous; albuminuria and paralysis are the chief of them. Sometimes extensive and deep ulceration may be met with about the tonsils and pharynx, which is slow in healing; and at times, though far less commonly than in scarlatina, a diffused brawny swelling of the connective tissue of the neck, such as has of late years received the name of Angina Ludovici.

The **Albuminuria** of diphtheria requires mention for many reasons. It is remarkably constant, though the quantity of albumin passed varies much; should it be persistent, and the quantity of albumin be large, although in other respects the child may seem to be doing well, the prognosis is of considerable gravity. One may notice further that it is a *symptom* of the disease—being present at an early period of the attack, often by the third or fourth day; that the urine is not as a rule characterised by scantiness, or the presence of blood; and casts, if present, are hyaline and not epithelial; that it seldom leads to after-symptoms, such as dropsy; and that the kidney does not usually show any definitely marked change. Thus, essential differences are established between the albuminuria of diphtheria and that of scarlatina; in the one it is an early, in the other a late symptom; in the one the urine is not characteristic, in the other it contains blood and epithelial casts; in the one no after-effects are observed, in the other dropsy is the rule; in the one the kidney shows no definite structural change, in the other there is a recognised form of nephritis. Gerhardt has found peptones in the urine of diphtheria. Hector Mackenzie's statistics* show that 60 per cent. of all cases develop albuminuria—76 per cent. of the fatal cases; 49 per cent. of the recoveries. The same observer concludes that it is more frequently present in the second week than in the first; that in proportion to the early appearance and the amount of albumin, so is the gravity of the case, and that it generally lasts to the fourth or fifth week.

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* R. W. Parker adds to this—"especially in conjunction with more or less complete suppression of voice."—*Tracheotomy in Laryngeal Diphtheria*, second edition, 1885.

Anuria, or complete suppression of urine, is one of the gravest symptoms of diphtheria. The child may seem to be doing fairly well, and, a point specially noteworthy, there may have been only slight albuminuria, when it is found that the child is passing no urine. Drowsiness comes on, vomiting is often persistent, but there are no twitchings or convulsions, and usually within forty-eight hours the child dies. In such a case the post-mortem may show no change whatever in the kidney, either macroscopic or microscopic, and one can only suppose that the condition is nervous in origin.

Diphtheritic Paralysis, unlike the albuminuria, is an affection of the convalescent. The first symptoms manifest themselves as a rule about four weeks after the onset of diphtheria; but we have known definite paralytic symptoms as early as the first week, and as late at the ninth week. In many cases the first thing complained of is tiredness in walking, the child is easily fatigued, or, it may be, staggers or even falls in attempting to walk. Then the voice is noticed to be altered, having a curious character somewhat like that of a person with cleft-palate, and about the same time some regurgitation of food through the nose, or an attack of coughing may occur on swallowing, and on examination the palate is seen to be partially or completely paralysed. Often the paralysis is much more extensive than this. It may extend to the external ocular muscles and cause squint; to the ciliary muscle and cause dimness of vision from erratic accommodation; and to the muscles of the trunk and extremities, producing a general paralysis, in which the child is unable to hold anything or to feed himself, or staggers about in a tipsy way, such as is very liable to be mistaken for a symptom of cerebral tumour if the practitioner be not on his guard. We have seen more than one instance of this in out-patient practice, where the history of diphtheria has been, as it may be, very unobtrusive.

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* *St. Thomas's Hospital Reports*, vol. xx.

Perhaps the most constant symptom of diphtheritic paralysis is absence of the knee-jerk. Persistence of the knee-jerk during the whole period of paralysis is very rare, but it is not so rare to find it still present in the early stage while the other symptoms are only slight. In most cases, however, the loss of the knee-jerk is one of the earliest symptoms, sometimes the first, and it may be the only one. An exaggeration of the knee-jerk followed by its diminution and subsequent absence is not uncommon. Diphtheritic patients may lose the knee-jerk without any paralysis. Deafness and loss of taste are quite occasional. Disturbance of common sensation is usually present when the motor paralysis is severe (Gowers). The condition of the bladder must be watched; as a result of weakness, particularly of the abdominal muscles, the child may be unable to pass its urine, and the bladder may become distended almost up to the umbilicus when there is extensive paralysis.

By far the most important symptom of diphtheritic paralysis, inasmuch as it is one of the two danger-signals of that condition, is paralysis of the respiratory muscles. Paralysis of the diaphragm is the commoner form; the chest moves excessively, and with each inspiration the abdominal wall is sucked in, to be protruded again with expiration. If the intercostals be paralysed the abdomen moves excessively but with normal rhythm, while the ribs, especially the lower ones, instead of rising with inspiration, are dragged down by the tug of the overworking diaphragm.

It is important to realise that, so long as the diaphragm or intercostals are paralysed, the child is in imminent peril. The slightest bronchial catarrh aggravating the already hampered respiration may prove fatal. The child is unable to clear its chest by its feeble expiratory efforts, and as secretion accumulates in the bronchial tubes, respiration becomes more and more difficult, until partly from exhaustion partly from asphyxia the child dies.

Dr. Pasteur* has drawn attention to the occurrence of extensive collapse ot the lung in children with diphtheritic paralysis. We have found this in many of the cases which we have examined, almost always in cases which died with paralysis of the diaphragm, perhaps because most of the fatal cases have this lesion. Quite recently in a little boy who died rather suddenly with diaphragmatic palsy, we found the whole of the left lung completely collapsed and part of the right lung also.

The other danger-signal, a complication perhaps rather than a symptom of diphtheritic paralysis, is dilatation of the heart, with or without irregularity of the pulse. This condition can only be recognised by careful examination of the physical signs at short intervals. It is perhaps most often found when, through oversight, or for some other reason, the child has not been kept strictly in bed. It may come on very rapidly, and is always of the gravest significance. Some, certainly, of the sudden deaths which occur during the paralytic stage are due to this complication.

The duration of symptoms varies considerably. The most prominent—viz., the alteration of voice, nasal regurgitation, squint, and paralysis of limbs—seldom last more than six or seven weeks, but the knee-jerks are often absent two or three months, and sometimes longer.

If recovery occur it is almost always complete. On first getting up, the child may find difficulty in walking, but this quickly disappears. A transitory cardiac failure will sometimes occur when all the symptoms except perhaps the loss of knee-jerk have gone. The child has been allowed to walk about, or perhaps only to sit up, and suddenly it changes colour, becomes very white, and perhaps asks to lie down. If the heart be examined now it will be found to be beating irregularly. Such attacks always indicate the necessity for further rest, and extra caution in deciding when the child may be allowed to sit up.

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* *Clin. Soc. Trans.*, vol. xxviii. p. 211.

But the prognosis is by no means always favourable, and the disease is always serious. Many, perhaps most of the fatal cases, are those in which the child has not been strictly kept in bed since the first symptoms of paralysis. At the Hospital for Sick Children, Great Ormond Street, statistics showed a mortality of about 15 per cent. in diphtheritic paralysis.

Failure of the respiratory muscles, and cardiac dilatation or irregularity, as mentioned above, always make the prognosis grave; frequent vomiting also is a serious symptom; persistence of albuminuria should make the prognosis guarded.

Paralysis is to diphtheria what dropsy is to scarlatina, a symptom which often leads to the detection of a hitherto unsuspected ailment. But in calling diphtheritic paralysis an affection of the convalescent, we must not forget that in the active stages of the disease we have also a paralysis which constitutes one of the gravest dangers of diphtheria—viz., paralysis of the heart; one can but suppose, indeed, that this is a part of the same tendency to the implication of the nervous centres as is seen in the stage of convalescence, and that in those terrible cases of sudden death, which are by no means uncommon both during the disease and convalescence, we have some sudden disturbance of the vagus, which thus manifests itself by means of its cardiac branches.

Morbid Anatomy and Pathology.—The fauces are more or less swollen, and covered with lymph; but the extent of the swelling and the amount of lymph may alike be small. In the most severe cases the uvula and surface of the pharynx generally are sloughy-looking, or the tonsils and adjacent mucous membrane are boggy or much thickened from a diffuse inflammation. In later stages the parts may be much defaced by deep ulcers—I have myself seen all these conditions. But the majority of cases which prove fatal, at all events of those in hospital practice, do so from laryngitis and extension of inflammation down the trachea. The mucous membrane of the epiglottis is thickened and crinkled, and a tough adherent membrane lines the laryngeal surface of the epiglottis and the interior of the larynx above the true vocal cords. A leathery layer often extends from these parts over the edge of the epiglottis to the base of the tongue, and over the ary-epiglottic folds to the mucous membrane of the pharynx; and the reflection of mucous membrane from the pharyngeal aspect of the larynx to the pharynx proper is a favourite seat for membrane, and one too which is not easily reached by local applications. In the trachea, the character of the membrane alters—it loses its toughness, all firm adhesion to the tracheal mucous membrane ceases, and only in exceptional cases is any tough cast of the respiratory passages obtained; by careful manipulation with water a flimsy cast may frequently be separated from the trachea and larger bronchial tubes; but it is more common to find the passages full of a thick puriform mucus with shreds or granules of membrane, the mucous membrane beneath being mottled and thickened from a diffuse inflammation of the submucous tissue similar to that found in the pharynx. The mucous membrane often fails to show any intensity of inflammation, as judged by injection. The extent of disease is apparent more by superficial ulceration, minute points of suppuration or early membranous formation, and a general pink and yellow mottling of the whole surface. The smaller bronchial tubes are usually full of thick pus, and the lungs in a state of more or less diffused broncho-pneumonia combined with atelectasis. It must be remembered that in nearly all these cases tracheotomy has been performed some hours, if not days, before death, and therefore that the morbid appearances below the larynx ought perhaps to be considered as a combined result of the disease, and of the operation rendered necessary by it in order to avert impending suffocation. But little more need be said—membrane is very occasionally found in other parts of the body, the gastro-intestinal tract: the genital passages, and the intestine should be examined; we have found the diphtheritic bacillus in almost pure growth in the membrane of membranous ophthalmia; anomalous appearances sometimes present themselves in the intestines, such as swelling and injection of Peyer's patches and solitary glands, or perhaps some more diffused enteritis, although no actual membrane may be present. But all such things are rare. Certain negative facts, however, are probably not unimportant—first, that the spleen, which in most conditions of blood-poisoning is large, soft, or pulpy, is not in diphtheria of abnormal size, and is usually firm; secondly, the kidneys show no change whatever to the naked eye, nor is anything very decisive found by microscopical examination. Small foci of micrococci with some associated disseminated nephritis are said to be present, although I cannot say that I have been able to substantiate the statement. Lastly, I would note, as a point which is, perhaps, not without value in reference to the pathology of the neuro-paralytic symptoms of this disease, that in some cases, in particular epidemics of diphtheria, meningitis has been found. I have myself once seen such an association of morbid changes, but it is a very rare condition in my experience, and apparently in that of other pathologists in this country.

Diphtheritic paralysis has been thought by some to be due to a species of anterior polio-myelitis of somewhat irregular distribution. There are now some sixteen cases published by Dejerine, Abercrombie, Kidd, and others, and in all much the same changes have been found. It is, however, worth remark that after-results, such as infantile paralysis, are extremely rare; * it would appear that most cases get perfectly well, though some die, but that between these two extremes there is no mean of permanent paralysis.

This interesting anomaly has been discussed by Dr. Buzzard in some most interesting lectures on peripheral neuritis,† in which it is urged that, in opposition to the observations just alluded to, and which point to disease in the anterior cornua, there are others which support the opinion that the disease is of the nature of a peripheral neuritis. Dr. Buzzard very justly remarks: "It must be remembered that the cases in which disease of the spinal cord has been discovered have been of necessity fatal cases; and the question is, What is the pathology of the infinitely more numerous cases which not only recover,

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* See Gowers' "Diseases of Nervous System," second edition, vol. ii. p. 911, for notes of two such cases.

† Harveian Lectures on "Some Forms of Paralysis dependent upon Peripheral Neuritis," lect. iii.

but recover without leaving trace of any permanent change I do not think that, with the clinical evidence before us, we a justified in saying that diphtheritic paralysis in its ordina form, passing to complete recovery, is dependent upon affection of the spinal cord. It is, in my opinion, mo reasonable to conclude that we have usually to do with per pheral neuritis of very varying severity."

Still more recently Dr. Batten * has reviewed the variou changes which have been found, and concludes, as the result o his own observations, that the lesion most commonly found i diphtheritic paralysis is a parenchymatous degeneration of th myelin sheath of the nerves. The researches of Dr. Marti show that such a degeneration may result in rabbits from th subcutaneous injection of an albumose obtained from the spleen and blood of persons who have died with diphtheria. The change is certainly degenerative rather than inflammatory, but whether it is primarily peripheral, or is secondary to changes in the cells of the anterior cornua, is still uncertain.

Pathology.—This has been already trenched upon in the opening remarks, but repetition will not be out of place in a matter of so much importance. Diphtheria is a contagious disorder, characterised by the growth of a bacillus (Klebs-Löffler). It is a short rod slightly bent, about as long as the tubercle bacillus, but twice as broad. The ends are rounded and often clubbed. With the growth of the bacilli a rapidly diffusible poison is generated, and by this the constitutional symptoms are produced. The poisoning agent is a tox-albumin. The behaviour of the disease is peculiar in many ways. For instance, it is associated with, or comes on after, so many different specific diseases. It is a frequent accompaniment of measles, of typhoid fever, of scarlatina. Exposure to the effluvia of bad drainage notoriously often precedes its occurrence, and catarrh and chronic inflammation of mucous surfaces predispose to it. Secondly, it is not protective against subsequent attacks. These are conditions which might well make one hesitate to consider the disease specific. But, on the other hand, in favour of specificity, we have the fact that it occurs in epidemics; that the period of incubation is fairly constant; that the symptoms are also uniform; and that there is abundant proof, both by cases and experiment upon animals, that the disease is transmitted by contagion.

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* *Brit. Med. Journ.*, 1898, vol. ii. p. 1540.

In bygone years, not yet far removed, it has been much discussed whether the disease is a local or general one ; but in view of the now prevailing doctrine that all specific fevers are due to the introduction into the blood or tissues of germs from without, that question loses much of its point. All such affections must now be held to be more or less local at first. The difference lies in this—that while some germs gain entrance by several doors, or diffuse themselves or their toxic products with great rapidity by many means, others proceed by more isolated routes, and produce results only after some process of maturation in the seat of infection. To this latter kind belongs diphtheria. There is evidence that the diphtheria bacillus in some cases enters the blood, and causes changes in remote parts by this direct method, but the most frequent affections of distant parts, as shown in albuminuria and paralysis, are due not to bacilli in the blood but to a soluble poison produced by the bacilli at the seat of infection, and thence carried by the circulation. This is well shown—though we cannot exclude the possibility of the direct transmission of the contagion from finger to throat—in the case recorded by the late Dr. Hillier of an eminent surgeon who pricked his finger in the operation of tracheotomy upon a child for croup. The next day the puncture became painful. The following day a pustule formed, and a day or two later the cutis sloughed. This was followed, in six days, by diphtheritic deposit on the tonsils ; and, a month later, there was paralysis of the soft palate, partial paralysis of the fingers and legs, and some impairment of sensibility. To this case many others could be added, where medical men have been inoculated by injecta from the throat and fauces, while engaged in painting the throat, in operating, or in clearing the trachea of membrane. Others could be cited where kissing has conveyed the contagion. Diphtheria, then, is the result of a germ introduced from without by direct contact. It, generally speaking, fixes itself upon the fauces or throat, and the resulting poison becomes generalised from thence ; but supposing it to gain an entrance by some other channel, such as the conjunctiva or skin, it still is liable to show a partiality for the fauces, and to appear, sooner or later, as a membranous exudation on that part. Some think, however, that the throat affection is then a direct infection by fomites from the primary seat of the disease. The contagion is not one which readily diffuses itself in the air, and therefore direct contact is the chief source of its propagation; but in this way it is possessed of considerable vitality, which evinces itself by the persistent way in which it clings to particular localities, or articles of furniture once contaminated by the sick. I have more than once seen a patient apparently infected by means of a bedstead which had undergone what was supposed to be thorough disinfection.

Quarantine.—The questions that arise on this head may perhaps best be stated in a practical way. A child of several in a family falls ill with diphtheria. The others are attending various schools; may they still continue to do so, or must they first be purged of any possible contamination? Now, any one of them may be already breeding the disease, so that on that ground all must be kept from school until the incubation limit of a week has passed over. So far as is known, there is practically no evidence to show that diphtheria is carried by an intermediary, not actually diseased, to a third person, and therefore, strictly speaking, such children might safely mix with others. But the interests at stake being great, it is generally advised that so long as there is diphtheria in a house all the children should be regarded as in quarantine.

Children who have been directly exposed to infection may be injected with antitoxin as a prophylactic measure (see p. 242): in some cases, for instance, where a child has been sleeping with another who is found to have diphtheria, this precaution is certainly to be advised.

A child that has had diphtheria remains contagious during convalescence, and probably so long as there is any ulceration of the fauces or discharge from the nose. Three weeks should be allowed to elapse from the disappearance of the membrane before the convalescent is allowed to mix with other children, and then only if the throat is healthy and there be no discharge from throat, nose, ears, &c.* It is now known that the Klebs-Löffler bacillus is to be found in the throat sometimes for many weeks after the recovery of health, sometimes even in the throats of persons who have never suffered from diphtheria: these two classes of cases throw so much doubt upon the infective power of the bacillus that we still think the above criteria are sufficient.

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* "A Code of Rules," *loc. cit.*

Diagnosis.—It is often very difficult to say from an inspection whether an exudation upon the pharynx and tonsils be diphtheritic or not, but in the present day our difficulties are lightened by the fact that it is always possible to take a swab from such a case and have it examined for the bacillus, and this examination is undertaken in some places by the medical officer of health, and can be completed within twenty-four hours. The difficulty which most often arises is in the distinction between the exudation of simple acute tonsillitis and that of diphtheria, a question we have already considered on p. 166.

Croup and Diphtheria.—The student must be prepared with some ideas on a question of such importance as this. I have already mentioned incidentally that there are many who think nowadays that all cases of membranous croup are diphtheritic—that membranous croup is that form of diphtheria which attacks the larynx. The points of distinction usually drawn are these :—Croup is a sthenic disease, diphtheria is a disease attended by prostration; in croup the urine is not albuminous, in diphtheria it is; croup is not followed by paralysis, diphtheria is; croup is not an epidemic disase, nor is it contagious, diphtheria is both. But these distinctions do not suffice for their purpose, because cases of croup are of frequent occurrence, in which holding perhaps at first, they fail afterwards; perhaps by the appearance of albumin in the urine, as is most common; perhaps by the occurrence of evidence that the disease in the particular case is contagious, such as the attack of two children in one house, the drainage of which is in good order, or the nurse or doctor taking the disease; or it may be by its appearance in an epidemic form. Moreover, it cannot now be contended that diphtheria is always attended by prostration—laryngeal diphtheria need not be attended by any such evidence of debility from its beginning to its end. Such cases frequently terminate purely by broncho-pneumonia and asphyxia. The question of contagion, again, depends much upon the existence of epidemic disease—all sporadic affections being less active in exhibiting contagious properties. Thus, of symptoms, those of disordered innervation alone remain as distinguishing between one disease and the other, and these are not available for the purposes of diagnosis at the time when it is all-important to form an opinion. But it is probable that before long we shall be in a position to settle this question. The observations of Dr. Washbourn and Dr. Goodall already quoted have clear shown that not all the membranous inflammations of the fauc are diphtheritic. It is only necessary to extend these observations to the membranous inflammations of the trachea an air-passages to allow of positive statements being made upo the point. For the present my own opinion is that there ar clinical grounds sufficient for a belief in the existence of a non diphtheritic as well as of a diphtheritic membranous laryngitis but until it is possible to distinguish readily and certainly in doubtful cases between the two (that is to say, in laryngeal cases, where the urine is free from albumin), it is better to consider all cases as diphtheritic, and to take precautionary measures in accordance with that assumption.

Catarrhal spasm, or laryngitis stridulosa, and simple laryngitis, may easily be mistaken for diphtheria; the chief points of diagnosis are mentioned below in the chapter on these conditions (chap. xxii.).

Scarlatina may be mistaken for diphtheria, but the points of distinction are numerous, and in well-marked cases should be decisive. The attack is sudden in onset, the pyrexia in like manner quickly attains a persistent altitude, the fauces are more generally reddened, and the strawberry tongue is present. The cultivation of the membranous exudation that is sometimes present produces no characteristic bacilli. Albuminuria is a sequela, not an early symptom, and it is associated with hæmaturia and dropsy. Lastly, endocarditis and rheumatism may follow scarlatina.

Tonsillitis.—The onset is sudden; fever is usually more acute, though this difference must not be pushed, as there are exceptions; the swelling is great and œdematous, often unilateral, sometimes without glandular enlargement, and when this is present the glands are usually softer than those felt behind the angle of the jaw in diphtheria; not a very common disease in childhood, except in mild form, as part of the history of a chronic tonsillitis.

Treatment.—Our present knowledge, which is derived in part from experiment, in part from the experience of the records of cases, teaches, as has been already said, that diphtheria is due to a germ which effects a lodgment usually in the fauces or respiratory passages, undergoes a process of incubation, and generates a poison there which then becomes generalised. This is the central point from which much of our treatment must be directed. Diphtheria is in great part a local disease, and is to be treated in great part by local measures, but since the introduction of antitoxin the local treatment has fallen into the second rank; for whilst it is by no means to be neglected, it has no such powerful effect as belongs to antitoxin. There can be no doubt now that the administration of antitoxin must come first in point of time as well as in importance; to temporise with local measures and defer the use of antitoxin is to diminish thereby the effect of the antitoxin and possibly to throw away the chance of saving a life. It is now widely recognised that to obtain the full value of antitoxin injection it must be administered at the earliest possible hour of the disease.

But let not reliance upon this serum treatment hinder us from persevering thoroughly in local measures. It may be that in many cases local treatment has not been very successful, but neither is the local treatment of ringworm very successful—certainly not if anything short of the most thorough measures be adopted; nor is the local treatment of cancer very successful, and yet local measures are not on that account discarded. The whole tendency of modern teaching is to make our local treatment of these diseases more searching; and so it must be with diphtheria. The parallel I would draw between diphtheria and ringworm of the scalp is particularly close; for both, according to present knowledge, are parasitic, and ringworm is acknowledged to be readily curable so long as it is superficial and does not dip into the hair follicles. Probably a similar invasion of the follicles, and even deeper structures, is a leading feature of the resistance of diphtheria to local measures. When superficial, the membrane is easily kept at bay; but when the surface is coated and the follicles are stuffed with micro-organisms, the extension of membrane is far less easily prevented, and a vigorous combination of local applications with serum treatment may be necessary if the disease is to be checked.

With this general indication of the lines of treatment we may pass to the consideration of particular methods.

Antitoxin.—Experiments carried out abroad by Behring, Kitasato, and others have shown that there exists in the serum of the blood of immune animals some material that neutralises the diphtheritic poison. This antitoxin, when injected subcutaneously, appears to arrest the disease, if injected in sufficient quantity and sufficiently early. Where exposure to infection has occurred, the onset of the disease may be prevented altogether, or the attack, if it occurs, be rendered less severe by prophylactic injection of antitoxin. Experience has confirmed the beneficial results of the use of antitoxin. Statistics taken from a large number of cases treated with antitoxin at the hospitals of the Metropolitan Asylums Board and elsewhere show that by this treatment the mortality has been reduced from 26 per cent. to 19 per cent.* Dr. Voelcker has recently published figures showing that at the Hospital for Sick Children, Great Ormond Street, during three years before the introduction of antitoxin, the mortality from diphtheria was 38 per cent., since the introduction of antitoxin it has fallen to 10·7 per cent.

In all cases, except those perhaps in which the membrane is very slight or is already disappearing, antitoxin should be used. The serum is now standardised, so that a "unit" is equivalent to ten times the amount required to neutralise ten times the fatal dose of the toxin as found by experiment on guinea-pigs. The strength of the various preparations differs, but the number of units per c.c. being known, the dose can easily be calculated; for instance, the preparation supplied by Messrs. Parke, Davis and Co., contains about 1000 units per c.c.; that prepared by the Lister Institute contains "not less than 2000 units" in about 4 c.c. Those preparations in which the necessary number of units are contained in a small bulk of serum will naturally be found most convenient, as being least distressing to the patient. The age of the child seems to make very little difference to the dose required, but about 3000 units is a suitable dose for a child two years old whether used for the already developed disease, or as a prophylactic measure. The serum is injected with a carefully sterilised syringe (of 10 c.c. capacity) into the subcutaneous tissue of the abdominal wall, the skin of which has previously been carefully cleaned with carbolic lotion

* *Clin. Soc. Trans.*, 1898. Report of Antitoxin Investigation Committee.

(1 in 40). If the case is severe, with extensive membrane and much nasal affection, as much as 6000 units may be given in a single dose, and a second injection of 3000 units may be given at an interval of twenty-four hours. It is essential that the antitoxin should be given as early as possible; when the injection is deferred till the child is thoroughly poisoned, the antitoxin may produce little or no improvement. In some cases where benefit might be expected but does not occur, it seems probable that the symptoms are due in part to a mixed infection with other micro-organisms, and therefore are not relieved by the antitoxin.

In many cases the spread of membrane is arrested by this treatment, and that which has already formed rapidly disappears. This effect upon the membrane is of special importance with regard to the treatment of laryngeal diphtheria. At the Hospital for Sick Children, Great Ormond Street, we have found that since the introduction of antitoxin many cases of laryngeal diphtheria with urgent dyspnœa could be tided over this difficulty by intubation, where in former days without antitoxin the continued spread of membrane would have necessitated tracheotomy. After the use of antitoxin it is common for a rash to appear, usually about a week after the injection. The commonest form is urticaria, which begins generally near the site of injection; it disappears without treatment after a day or two. Sometimes the rash consists of a patchy erythema, slightly raised but not urticarial; and in rare cases it consists of a dusky purplish mottling suggesting some septicæmia. And indeed this seems to occur sometimes, for pyrexia may be present, and in rare cases we have seen severe joint pains and even delirium.

Even with the utmost care over asepsis, one is almost sure in some case or other to get some inflammation at the site of injection; usually a hot fomentation is sufficient treatment, but we have once or twice seen an abscess occur.

Local Applications.—It is easy enough to *order* the application of a spray to the throat; it is easy enough to *order* the fauces to be swabbed with this or that gargle or lotion; but orders of this kind usually result in some utterly ineffectual application. To keep diphtheritic membrane at bay the application must be thorough, and, it may be, frequently repeated. This means a frequent disturbance of a child whose only want, perhaps, is to be let alone; and a thorough application of anything to the fauces means generally that the strong resistance of a struggling child has to be encountered—perhaps taking two people to hold it whilst a third attends to the throat—perhaps necessitating the employment of a gag; and all this with an amount of spluttering, gasping, and choking from the irritation of the epiglottis and larynx, such as makes the parents recoil from it with dread, and with which only the strongest determination and belief in the value of the means will enable the physician to persevere. No one who accepts the bacterial nature of the diphtheritic process, who clearly realises the nooks and crannies of the throat and fauces in which membrane delights to grow, and the difficulties of management of unreasoning childhood, will have any difficulty in understanding why local treatment has often failed—why it will often fail again. But this should not deter us from returning to the attack with all possible additional aids and suggestions. And of local measures, I prefer the application of antiseptics rather than escharotics. They must be repeated as often as membrane begins to form on the surface; and since prevention is more easy than cure, whatever local applications be adopted should be applied at regular intervals, until the chance of fresh formation of membrane be altogether past. To this end, then, any membrane that is in reach, and that can be detached readily by the forceps, may be removed, and some germicide applied freely to the diseased surface. This plan is held by many most experienced men to be useless, or worse. It is harmful upon the ground that any injury to the mucous surfaces encourages the fresh formation of membrane. It is useless because the noxious germs composing the membrane have already passed beyond the reach of local applications into the lymphatics and blood-vessels beneath. Such reasoning does not convey conviction to my mind, and the want of success upon which it is founded is, as I have shown, not altogether surprising. It is advisable to apply all solutions as gently as possible. The healthy mucous membrane should be in all cases respected. But the little bleeding that ensues upon detaching a thick flake of perhaps fetid membrane can surely be of but little importance; and supposing that the membrane forms again, things are not worse than they were before. Of local applications many have been recommended. I prefer a saturated solution of borax with bicarbonate of soda, or boric acid in glycerine, the solution being made by the aid of a water-bath; or a solution of permanganate of potash, twenty grains to the ounce; or a ten-grain to the ounce solution of quinine, made by the aid of hydrochloric acid, in equal parts of glycerine and water. These are not unpleasant, the borax or boric acid least of all so, and can be applied by painting with a bent laryngeal camel's-hair brush, or better, as has been suggested to us by Dr. Matthews, with a piece of copper wire ten inches long, at the end of which cotton wool is fixed as a swab. The wire has the advantage of being easily bent to any angle and can be sterilised in the fire. But the application can, if it be preferred, be made by means of a hand spray—the nozzle being placed upon the tongue between the teeth, or passed through Dr. Thomas Eastes' ingenious funnelled tongue depressor, and the pumping continued for a few seconds. The application must be repeated at least every two or three hours, often every hour. I have used much and like Dr. Thomas Eastes' solution of—

Linimentum iodi	♏ xl
Acidi carbolici	ʒij to ʒiv
Sp. vin. rect.	℥ss
Glycerini	℥iv
Aq. ad	℥viij

which is used as a spray every hour until the throat begins to clean, and then every two hours or less often. I think well, too, of paraffine-oil as a paint. I have used it now many times and the cases have, as a rule, done well. Some cases do well on free dusting with sulphur. Other things have been recommended, such as perchloride of iron in glycerine, sulphurous acid in glycerine, solution of liq. sodæ chlorinatæ or chlorine water, carbolic acid, &c. These are all antiseptics or germicides, and are radical in their intention; others are useful for dissolving the membrane, and of these lime-water and carbonate of soda solution (twenty grains to the ounce), used as a spray, are at once effective and harmless. Lactic acid ♏ xv to ♏ xx to the ounce of lime-water or simple water is thought highly of by some. For the same object Dr. Hale White has proposed a solution of pepsin in glycerine. Papaine is a remedy of this class, and I have seen it used in several cases with apparent success. Jacobi speaks well of a 1 in 20 solution in water for spray or painting.

General Treatment.—For internal administration many experienced practitioners insist strongly upon the value—nay, even almost the necessity—of a preliminary aperient of calomel, followed, it may be, by some castor-oil, if the mercurial is not sufficiently effective. In laryngeal cases I have sometimes seen good results from combining calomel with ipecacuanha in a powder; $\frac{1}{6}$ grain of the one and $\frac{1}{2}$ grain of the other, gi every hour, will clear the bowels and sometimes loosen and le to the expulsion of membrane. After this the various dru that have been recommended are too many even to recount. chlorate of potash or guaiacum lozenge may be given every thr or four hours, or the citrate of iron and quinine in glycerine, chlorate of potash and perchloride of iron in equal parts glycerine and water. Pilocarpin is a remedy that may be trie cautiously, as some good results have been obtained by its use Lax, who has tried it, recommends a sixth of a grain or more t be given by mouth in watery solution. But it is not a ver safe remedy for young children, and bad results have followe its administration.

Cases of diphtheria should have plenty of fresh air, but be kept warm in bed, and the air should be kept charged with a moist disinfectant vapour. One of the best is, I think, the following:* Creosote ʒj, pulv. acaciæ ʒij. The gum and creosote are rubbed up together, and added to two ounces of lotio acidi carbolici (1 in 20). The whole is then put into a bronchitis kettle with a pint of water. A not unpleasant vapour is given off, distinctly different from either creosote or carbolic acid. A teaspoonful of terebene put into half a gallon of water makes another useful and not unpleasant inhalation; but the terebene volatilises rather quickly, and must therefore be frequently replenished. Sanitas also is a good and pleasant disinfectant. One of my friends is very fond of sulphur, which is slowly evaporated into the air of the room by means of a heated brick.

The food given must be of the strongest: milk, eggs, strong beef-tea, Brand's essence. If children refuse liquids, there is no particular objection to the administration of solids; and for those who are difficult to tempt, it may be advisable to try artificially digested foods, which are most seductively administered in the form of jelly or blanc-mange. Alcohol also must be given in many cases, and in large quantities: two or three ounces of brandy in the course of the twenty-four hours. In the worst cases it may be advisable to try suppositories or enemata; but the latter are not borne long by children, as the rectum becomes irritable and expels the foreign matter after perhaps one or two have been retained. Failing these methods, food may be introduced into the stomach by means of a soft catheter passed along the floor of the nose into the œsophagus, or perhaps even better, as Dr. Carpenter has shown me, by slowly injecting liquid food by means of a glass syringe passed into the nostril, the child lying in a horizontal position.

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* Dr. John Phillips introduced this formula when resident medical officer at the Evelina Hospital.

Tracheotomy.—If the child is choking it is obviously right to give it the further chance which opening the windpipe offers; no one will dispute this. The chance appears to vary somewhat in the experience of different physicians, but probably Trousseau's original estimate of his own cases—one recovery in five—is about the average all round. Still, there is no little difficulty in deciding this question, for there is probably no operation in surgery, if I may venture to say so, which requires so much the personal supervision of the surgeon as tracheotomy, and I believe there can be few in which the degree of hope which may be indulged depends so much upon the after-treatment. But it is the custom of the advocates of operation to argue that the mortality after tracheotomy is so great because the operation is postponed till too late; that the operation itself is not a serious one, but that it cannot be expected to succeed if the disease has extended down the trachea, and that if performed early more success would attend it. Now first of all let us clearly understand what this means. It means that the trachea is to be opened before there is any immediate risk to life, and this is a very different thing to an operation which is the only chance left of life. But there can be no objection to an early operation if no extra risks are entailed by it, or if any extra risk is compensated by advantage gained, such as, *e.g.*, if by operating early the formation of membrane can be arrested. I would venture to dwell upon these alternatives, as I do not think they have been always well considered. Early operation has been defended chiefly upon the ground that the operation is not a serious one. Now I say that in *diphtheria* it is a serious operation. It is *primâ facie* unreasonable to contend otherwise if it be true, as many think, that even the membrane on the fauces should not be disturbed for fear of provoking fresh inflammation and formation of membrane; and, as a matter of fact, the operation of tracheotomy, when performed upon the diphtheritic child, is frequently followed by diffuse inflammation of the cellular tissue of the neck—the edges of the wound gape, and a large sloughy surface is formed, which becomes dry and fœtid, and not unfrequently covered with membrane. But, further, is it to be supposed that the mucous membrane of the trachea itself suffers no injury from the introduction of the tube? The richness of its glandular and blood supply, and its sensitiveness to changes of temperature, makes such a thing highly improbable, whilst it would be easy to show in the clearest manner, from the evidence of the post-mortem room, that the operation itself, and the presence of a tube afterwards, are, in one way and another, fraught with danger. It is, in fact, my belief that the broncho-pneumonia, the purulent bronchitis, the excessive tracheitis, so often seen in fatal cases of diphtheria, are chargeable quite as much to the operation as to the original disease. The state of the trachea in fatal cases is not calculated to impress one favourably with the harmlessness of tracheotomy; but let that pass, for it may well be said that these are the hopeless ones *quâ* diphtheria. But even in others that do well the amount of mucus and muco-purulent discharge ejected from the tube and the slowness with which this ceases, are sufficient to show that the mucous membrane of the trachea must in any case undergo grave alterations. For these reasons, amongst others, early tracheotomy in diphtheria must be advocated, not from its harmlessness, but upon other grounds. But hitherto these other grounds have been little appealed to in practice. The operation has been performed: if happily the membrane failed to spread—well, but no thanks to treatment; the operation relieved a symptom and temporised while the disease spent itself. If death resulted, it was only to be expected of the disease; the operation has taken no share of the responsibility. But if, on the other hand, we resort to an operation not immediately necessary, in the hope that, by so doing, some local measures may be adopted which will help to combat the formation of membrane, the operation has another basis upon which it may stand of a less assailable nature. Upon this ground alone—that of the more thorough application of local remedies to the larynx—does an early operation, in my opinion, admit of advocacy. Possibly on this ground the operation will yet justify itself, and the additional risk which it necessitates be more than counterbalanced. It cannot be said that this is so at present; and, although I would urge perseverence in local measures, I still think that the operation of opening the windpipe should be deferred to the latest practicable moment.

But the introduction of antitoxin necessitates an additional word both on the one side and the other. We have certainly been agreeably surprised, since the application of this new method, how well tracheotomies have done. The extension of the diphtheritic process to the wound seems to have been controlled, and the children have recovered in proportions we have not seen before. So far this is in favour of being less timorous about operating.

On the other hand, we are now most of us familiar with cases where suffocation seemed to be impending, and an injection of antitoxin has brought speedy relief, which under further measures of the same sort has become permanent.

When tracheotomy has been determined upon, the principles upon which success depends is to tamper with the tracheal mucous membrane as little as possible. To put a tube into the trachea and to leave it there, save for changing it occasionally, is but to substitute for the risk of choking the more deadly one of diffuse and ulcerative tracheitis. No doubt a certain sense of security is felt by the surgeon when a tube is safely in the throat, but this is dearly purchased for him by his patient, and the largest percentage of successes will certainly be procured by dispensing with the tube as much as possible. But this treatment cannot be carried out without a trained nurse who is equal to removing and reinserting the tube, and who is also possessed of sufficient self-command to meet the still greater emergency of not being able to reintroduce it, when of necessity the wound must be kept open by forceps until assistance can be procured. With a nurse thus endowed, and the frequent supervision of the surgeon, one cannot doubt for a moment that the stated mortality can be, and has been in the hands of individual operators, largely reduced.

The operation itself is a surgical procedure, and it may perhaps be thought that I have no necessity and no right to speak upon that subject. Nevertheless, on the principle that lookers-on see most of the game, I shall venture to add what seem to me hints of importance for its due performance.

The rules which I would lay down for the conduct of openin the windpipe are these: The operation should be as high a possible, (1) because it may be necessary to deal locally with th formation of membrane in the larynx by means of the apertur and this can be more effectively done when the operation is hig than when it is low; (2) because it is not advisable to interfer much with the *tracheal* mucous membrane; and the connectiv tissue of the neck is less encroached upon in the incision. Whe the trachea is opened, the incision should be well separated by a dilator and the parts thoroughly examined. This done, any membrane discovered either above or below it is to be removed gently either by forceps or by a soft feather, and if necessary an application may then be made to the larynx of a solution of boric acid or borax in glycerine, either by a feather or the spray. The opening must be kept free, but the interior of the windpipe is only to be touched in obedience to this necessity. The expulsion of membrane is thus favoured, and the risk of extension of inflammation down the trachea is reduced to its minimum. To accomplish these objects some instrument, such as Golding-Bird's dilator, or Parker's automatic retractor, seems to me best in principle, although perhaps a metal tube of the largest bore that can be introduced is more available for practice. This must be inserted for the first twenty-four hours. By this time any inequalities upon the sides of the incision which would be likely to hinder the reintroduction of the tube will have become sealed by lymph. After this our aim is to do without any dilator or tube as often, and for as long a period, as an unembarrassed respiration will allow. Whatever the instrument employed, it should be removed, the child being closely watched, so that it may be reinserted when necessary. The time for which the dilator can be removed will vary much. Sometimes not more than ten minutes can be allowed—sometimes half an hour, or an hour, or more; the longer the better. Some cases have been treated successfully throughout without any tube, and I suspect this could be done more often and with much advantage to the patient. After a day or two the metal tube is to be replaced by one of Mr. Morrant Baker's soft india-rubber tubes, as short as is consistent with safety. When the edges of the wound have consolidated, the curve of the tube may be removed, leaving a straight stump, only long enough to reach from the surface through the œdematous tissues to the trachea. So far as the nature of the material is concerned, I believe it would be better to insert a soft rubber tube at once, but the objection to this is that the bore of these is smaller than that of the metal tubes, and for the first day or two it is of paramount importance that the aperture should be as free as possible. When the tube is removed or replaced, the opportunity must be taken, if it be judged necessary, for applying the boric solution to the larynx; the trachea should only be treated in similar fashion if there be evidence that the membrane is extending downwards. The application may be made by a feather or a laryngeal brush, or by a piece of sponge or cotton-wool twisted into a loop of wire. If preferred, a spray can be applied to larynx or trachea through the opening. I have no great affection for feathering the trachea for the removal of membrane, and probably a free aperture best effects its expulsion; but one of the risks attaching to the operation is the loss of expiratory power, which results from opening the trachea below the larynx, and on this account it is requisite to be ever on the alert to remove membrane either in this way or by the tracheal forceps, which must always be ready to hand.

I must further add, as regards the final removal of the tube, that those only who have had experience of such cases know how difficult this often is. What the exact conditions in the trachea or larynx may be that render it so are difficult to state, but many days, and sometimes weeks, will often elapse before the tube can be altogether dispensed with. Perhaps the child will breathe well by day and badly by night, or will go without the tube completely for three or four hours and then have dyspnœa. In all these cases the short tube should be worn, if possible, and the external aperture should be often plugged so as to compel breathing by the natural passages.

Intubation.—As an alternative to tracheotomy there is now the operation of intubation, or that of passing a tube into the larynx *per vias naturales,* and retaining it there as long as may be necessary. Originally advocated by McEwen, the operation has been elaborated by O'Dwyer, who has devised an ingenious set of instruments for the purpose. The operation has been largely practised in America, and has met with warm advocacy, as well as some detraction, there. There is no doubt that it is an operation which can only be performed after some practice, and that during the wearing of the tube the child requires to be very closely watched by the surgeon, as the tube is sometimes coughed out and may require to be changed. The reinsertion of the tube requires an amount of skill which a nurse would never have the opportunity of acquiring. For these reasons intubation is but seldom adapted to the exigencies of private practice, although in hospital where a medical officer is always within speedy call, it has given excellent results, and in many cases within our own observation has obviated the necessity for tracheotomy where asphyxia was threatening. But even where circumstances make intubation feasible it should be remembered that as in tracheotomy, the wearing of a tube is by no means without risk; we have seen extensive ulceration of the larynx and trachea at the points of pressure, and it has seemed possible in some cases that this has led to the production of a septic pneumonia; the tube should therefore be removed at the earliest possible moment, and it may be necessary to make several trials at intervals of twelve hours or less to find out when the child can dispense with it safely. We are inclined to doubt whether intubation will ultimately take rank as a generally serviceable measure in diphtheria, but it may probably do so for cases of simple laryngitis and œdema. If necessary, McEwen's original suggestion, which practically amounted to catheterisation of the larynx, is a ready and effective procedure.

Creosote vapour has already been advised (p. 246), and plenty of fresh warm air. Many recommend a steam-tent, but, provided the cot is well fumigated by the moist vapour, this is hardly necessary, and it often makes the child hot and restless.*

There is yet the **treatment of diphtheritic paralysis** to be considered, and this may be both preventive and curative.

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* For fuller information upon the operation of tracheotomy in diphtheria the reader is referred to Mr. R. W. Parker's little book on "Tracheotomy in Laryngeal Diphtheria," second edition, which in precision of instruction and fulness of detail is admirable.

It is of the utmost importance to remember that diphtheria is a disease which leads to great anæmia—great exhaustion; and it is the opinion of many that if after diphtheria the child be confined to bed, kept quite free from excitement, and fed frequently, and so treated until the nutrition has been in some measure restored, and the anæmia curtailed, paralysis will but seldom occur. There can be no doubt that to be up and about in the early days of convalescence, feeling ill, but without anything definite the matter, is one of the surest incentives to its onset. It is, however, to be remembered that, like the albuminuria of scarlatina, the paralysis after diphtheria may follow such cases of indefinite disease as the malaise and slight sore throats which so often run through a household when one of its members is attacked with the pronounced disease.

When paralysis has come about, perfect rest in bed is the first necessity, together with the most nourishing food. Food must be given at frequent intervals, and it is well to remember that in the paralysis of the throat solids or thick fluids are often better swallowed than liquids. In a troublesome case of this kind, when the child was quite unable to swallow liquid, we administered both food and medicine to a young child for many days entirely by way of jelly. And one was surprised to find how exceedingly palatable a combination of the tincture of perchloride of iron, strychnine, brandy, and glycerine became by this method. It may be necessary to feed by means of a tube passed into the stomach, in which case the nasal tube is the more easy of passage. Enemata, or nutrient suppositories, may also be given; and in addition to the food, stimulants are valuable, and maltine and cream may be given with advantage. The greatest care and patience are requisite in feeding these cases, lest they choke, or food passing into the larynx and trachea should set up a broncho-pneumonia. Most of the cases of localised faucial paralysis recover but slowly, and a great deal of inconvenience may be experienced for months—sometimes in swallowing, sometimes by difficulties in phonation. When the affection is general, it is always tedious and often dangerous: the heart suffers and the respiratory muscles also; the one becoming dilated, the others, by their sluggish and imperfect action, leading to collections of mucus in the bronchial tubes and so to broncho-pneumonia. These cases must be fed as others, iron, quinine, strychnine, or arsenic must be administered, and the muscular system may, perhaps, be improved by the passive movements of shampooing. The use of electricity is rarely advisable in children, as the disturbance and distress which it almost always causes in them can only be dangerous in diphtheritic palsy. In paralysis of the heart in its worst forms the sudden fatal issue precludes all treatment; but a careful watch upon the heart should be kept in all these cases for the earliest indications of dilatation of the ventricles. A careful administration of digitalis, or belladonna, and iron, and stimulants, may sometimes be attended with successful results. If time admits, too, I now always advise the subcutaneous injection of strychnine. I think I have seen it of use in these worst of all cases; and certainly so in the more common case of paralysis of the palate and extremities. The liquor strychninæ of the British Pharmacopœia lends itself very well to administration by this means; one drop ($\frac{1}{100}$ gr.) diluted with four of water makes a suitable dose to commence with, except for the very youngest infants. At the Hospital for Sick Children, Great Ormond Street, it has been the custom for several years to treat bad cases of diphtheritic paralysis by hypodermic injections of atropine, generally combined with strychnine. This use of atropine, first suggested by Dr. Lees, certainly seems to do good in severe cases. The dose usually given is one minim of the liquor atropinæ every four or six hours according to the age of the child. Flushing and dilatation of the pupils often follow, and seem to do no harm; but if delirium or vomiting occur, the dose must be diminished or omitted for a time. In the milder cases the same combination is given by mouth, with good results.

CHAPTER XVI.

VARICELLA—VACCINIA.

Varicella.—The chief interest of chicken-pox lies in its resemblance to small-pox, and in the suggestions which come out of this resemblance. The relation of vaccinia to variola, and the different behaviour of the latter when introduced by inoculation to that when operating on virgin soil, under conditions of introduction, so to speak, of its own choosing, show how liable is variola to undergo modification. And when further we bear in mind the many points of resemblance which modified variola bears to varicella, the question irresistibly presents itself, is varicella modified small-pox? To this the answer must be—No, for many reasons, but this one above others—conclusive as it is considered for all exanthems—that varicella and variola may both occur within a short time of one another in the same person, and pursue an unmodified course. One of the most striking cases of this kind is recorded by Dr. Sharkey in the *Lancet*, vol. ii. 1877, p. 47.* A boy, aged five, under Dr. Bristowe, was admitted with varicella out upon him. Variola was rife at that time, and existed in the block where the child was warded; he was on this account vaccinated the third day after admission, and took very well. Ten days after admission, the eighth day from vaccination, he became very ill, and the next day the variolous eruption appeared. Varicella does not therefore protect from variola, nor does vaccinia protect from varicella, and it is consequently assumed that the germs are distinct.

Incubation.—This is variously stated to last from eight to sixteen days. Dr. Dukes, from some careful observations made at Rugby, makes it as long as fourteen to nineteen days, the shortest incubation in fifteen cases being: thirteen to fourteen days in one case, fourteen in two, fourteen or fifteen in one, fourteen to sixteen in two, fifteen in three, and in the remainder more. Mr. Fraser, of Romford, tells me of a family of four children in which each took the disease as follows:

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* Dr. Theodore Acland has, however, put forward another possible interpretation of this case (*Clin. Soc. Trans.*, vol. xxvi. 1893), viz., that the second eruption was not that of variola, but of a generalised vaccinia.

A children's party on September 1 was supposed to be the source of infection. The eruption appeared in the first child, *æt.* 8, on September 15; the child was then isolated. The second child, *æt.* 5, was attacked on the 29th; the third, a baby, on October 11; and the fourth, a boy of 11, on October 14.

The incubation period is attended by no definite symptoms: but there may be slight malaise for a day or two before the outbreak of the eruption.

Eruptive Stage is generally associated with more or less pyrexia, loss of appetite and languor; but the amount of constitutional disturbance may be, and usually is, very slight indeed. In unhealthy children the eruption may be copious and the resulting sores lingering in their course, and in such the illness may be considerable, and even followed by persistent anæmia, discharge from the ear, or some enlargement of glands; but this is rather an outcome reserved for the squalid and forlorn than for the child of the well-to-do. It is also stated—and this is interesting when we remember the mortality which attends measles in native races—that the death-rate is sometimes high in India amongst the ill-fed and badly clothed children of the native population. The eruption consists of oval or globular vesicles containing opalescent contents situated upon a slightly inflamed base. The vesicles commence as a small red papule, the vesicle forming within a very few hours whilst the amount of inflammation around it constitutes a measure of the severity of the disease and of the condition of the patient. In many cases there is no areola around the vesicles; a small pearly bleb rises from an almost natural skin, and the appearances suggest that the child has been exposed to a shower of boiling water. In severe cases the zone of injection around is vivid and considerable. The eruption comes out in crops, one crop quickly succeeding another, mostly on the back and abdomen, but also found on the face, scalp, and other parts, more rarely in the mouth. The vesicles form rapidly; they contain alkaline serum, which becomes a little turbid, in some cases purulent. In ordinary cases the vesicles shrivel within a day or two and leave a small dry scab. This falls off after a few days and leaves behind a small pigmented stain, and occasionally a slight scar. Mr. Hutchinson thinks that scars are not uncommon if carefully looked for; but perhaps this depends upon the extent of local change; that if the vesicles are rubbed or excoriated in any way—or if the vesicle ulcerates, as it may sometimes do—they will be found, but not otherwise. The vesicles come out in crops, occasionally lasting for six or eight days, but usually exhausting the disease within three or four days, or even sooner.

The disease may occur in quite young infants. It but seldom recurs, and, with one exception, has no complications of importance. It may, however, be stated that the vesicles are attended with a good deal of irritation, and in the unhealthy children of the hospital out-patient room it is not uncommon to find somewhat persistent superficial ulcers, perhaps beneath scabs, for some time after the outbreak of the varicella. But when this is so, the student should have it in mind that the original malady may perhaps have been pemphigus and not varicella. The exception alluded to is **Varicella gangrenosa,** of, which several cases have been recorded, and which, if it may be considered as of several grades of severity, is, perhaps, not uncommon. Its mildest form is that just described, where persistent superficial ecthymatous sores remain for some time after varicella. In the next grade—whence the disease derives a special name—the body is more or less covered with deep ulcers, which have a sharp angry-looking edge, and a black gangrenous crust within it. The ulcer may be evidently formed by confluent vesicles, and for this reason, as well as from the fact that he had found it repeatedly associated with varicella, Mr. Hutchinson * was directed to what he believes to be, and what is now generally accepted as being, its real origin. Mr. Hutchinson was further able to identify it as passing under other names, and he gives strong reasons for thinking that the so-called rupia escharotica as represented by some models in the museum of Guy's Hospital (Skin series, 206, 207) are of this nature, as also an epidemic of "An Eruptive Disease in Children," described early in the present century by Dr. Whitley Stokes of Dublin, and another described by Trousseau, and alluded to below. There is a still worse form than this, in which the gangrene is diffused and attacks a large part of one or both limbs, or a large surface of the trunk, and when, unless attention be called to the circumstance, the affinities of the disease are still less likely to attract attention. A case of this sort has been put on record by Mr. Bellamy.* It might be thought that there is nothing peculiar in such an occurrence—that, given the pre-existence of starvation and neglect, the outbreak of a pustular eruption such as this would be likely to engender an ecthyma—but it would appear that this explanation will not hold, for Mr. Hutchinson makes special note of the fact that the affected children were some of them at any rate vigorous and healthy. Dr. Payne has devoted attention to the point, and he suggests that possibly the existence of tubercle in the child may lead to the very severe manifestation of chicken-pox. At any rate, tubercle has been found to be present in the bodies of most of the cases to which Dr. Payne has had access.† If this should seem insufficient, we must, for the present, fall back on Mr. Hutchinson's suggestion of special idiosyncrasy—or perhaps we may say, that what rupia is to syphilis, cancrum oris to measles, vaccinia gangrenosa to vaccinia, as we shall presently relate, so gangrene is to some cases of varicella, a risk that it shares with other exanthems.

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* *Medico-Chir. Trans.*, vol. lxv. p. 1.

Diagnosis.—Modified variola causes the most difficulty. But varicella has no prodromal fever: the vesicles are not umbilicated, and collapse at once when pricked—in other words, they are simple, not multilocular; and the eruption comes out in crops, and therefore exhibits stages upon the skin; while variola appears at once. The student must not, however, insist too absolutely on the absence of umbilication. The general character of the blebs must be considered, and this should be pearly and not dimpled. I have often seen, as Dr. Starr notes, an occasional bleb with an umbilicated appearance. This is usually seen in the larger vesicles, and is due to the drying up of the contents in the centre of the bleb.

Pemphigus can hardly cause any difficulties, if the case be thoroughly inquired into, unless, indeed, we have to do with cases such as have been described: (1) by Mr. Hutchinson as **persistent or relapsing varicella**—where the disease may last as long as a month; (2) by Trousseau, in which blebs like those of pemphigus come during fifteen to forty days, causing ulcerations like those of pemphigus, which continue for six or eight weeks.

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* *Clin. Soc. Trans.*, vol. xx. p. 195.

† *Trans. Path. Soc. Lond.*, vol. xxxvi. p. 471.

Varicella has also occasionally to be distinguished from vesicular or pustular rashes following upon vaccination. Hebra says of them that they resemble varicella. They are not very common.

Sequelæ.—Most writers would be inclined to say that there are no sequelæ of varicella; but superficial ecthymatous-looking sores are by no means uncommon in the hospital out-patient room. Mr. Hutchinson alludes fully to this condition, and how it may resemble pemphigus. Under the term "varicella prurigo," adopted by him, are included not only the clearly vesicular rashes, which continue after varicella, but also many of those papular prurigos which have hitherto been called "lichen urticatus, lichen strophulus," &c. Mr. Hutchinson points out that many of these cases called "lichen" show abortive vesicles; that they appear on the palms and soles, where no lichen can—seeing that it is a disease of the hair follicles; and that there is, in some cases at all events, a history, if not of origination in a recognised varicella, yet at any rate of definite onset at some particular date. Mr. Hutchinson seems, however, to adopt a view that I have long accepted—and which minimises the value of insisting that they originate in varicella—that in these cases it is hardly so much the disease which is at fault as the child: it is the fact of the occurrence of varicella—a disease which is apt to start a chronic itching—in a pruriginous skin (not uncommonly an inherited weakness) which entails such disagreeable results upon the child. At any rate, I cannot doubt that these cases are identical with the disease called "strophulus," the abortive vesicles and the occurrence of papules in the palms and soles notwithstanding; and I may add Dr. Hilton Fagge's opinion in support of my own. Dr. Fagge writes of varicella prurigo: "I believe it to be an exaggerated form of strophulus." *

Nephritis was recorded by Henoch as a sequela in four cases of varicella; we have seen this occurrence in one case, and several others have been recorded; the symptoms of nephritis have usually appeared within fourteen days after the first appearance of the varicella eruption.

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* "Principles and Practice of Medicine," vol. i. p. 236.

Quarantine can be but rarely a question of any serious importance, but when delicate children, and particularly those who have tubercular tendencies, are in question, it would be right to hold that a week should elapse after the last pock appeared, provided that by that time the skin is free from all crusts.

Treatment.—Varicella very seldom requires any—at the most some simple saline, a mild aperient, and a little vaseline, ung. metallorum, or cold cream and borax, to relieve the local irritation of particular spots, are all that can be necessary. Varicella gangrenosa in its severer forms is too often fatal. The sores should be kept clean, and dressed with carbolic oil or mild nitrate of mercury or boric acid ointment, and quinine, iron, and alcohol given as medicine.

Vaccinia.—Of this as a disease it is hardly necessary to speak, so little in the majority of cases does it affect the child's health. But this much may be said, that amongst the lower orders a large number of cutaneous affections are attributed to vaccination. If assertions of this kind are traced to their source, many have no foundations in fact. Yet some have—and it is well not to discredit such tales too readily. In some cases a roseolous rash appears about a week or ten days after inoculation, in others a papular, vesicular, or even pustular eruption may occur, and rarely a generalised eruption of true vaccine vesicles is seen. A certain number of rashes which occur after vaccination seem, as has been pointed out by Dr. Carter,* to result directly from inoculation with pure vaccine, but in other cases where erysipelas or impetigo or gangrene occurs, there is an accidental introduction of some virus either at the time of inoculation or after the rupture of the vesicle. It would be a very wonderful fact if the introduction of a material such as vaccine into the system never proved detrimental, if it never detected a delicacy or an idiosyncrasy out of the many that are beyond our power of appreciation, and unquestionably, from time to time, vaccination is followed by various forms of cutaneous eruption and of ill-health, of more or less serious nature. The risk of such an occurrence is as little to the individual as the gain to the community is great from the practice;

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* *Lancet*, 1898, vol. ii. p. 477.

but the occasional occurrence of such a result is an incentive to the exercise of the most scrupulous care in vaccinating only such infants as appear healthy, and in selecting only such lymph as is absolutely pure. There can be little doubt also that much of the inflammation which is often seen spreading from the vesicles over a wide area, might be prevented if more effort were made to attain asepsis not only by proper precautions at the time of inoculating, but also by keeping the site of inoculation covered by a sealed dressing (for which purpose suitable pads can easily be obtained) so that no exposure to contamination is possible. The ordinary pad which is simply tied on can be and often is removed by anxious parents to see how the vaccination is getting on; this, at any rate, is prevented by a dressing which is fixed in place by suitable adhesive plaster. **Vaccinia gangrenosa** is the most grave, as it is happily the most rare, of untoward results. And to Mr. Hutchinson we are indebted for our knowledge of it, as we are for that of its varicellar congener. It is quite similar in the appearance of the gangrenous patches to varicella gangrenosa, and to the description of that disease the reader may refer. I may, however, add that vaccinia gangrenosa is also—like varicella gangrenosa—a term to which some latitude must be allowed. I take it to be a label for a group of cases, the individual items of which vary considerably. In the few cases I have seen the history runs thus—that the child was born quite healthy, and remained so until vaccination. The vaccine inflammation was perhaps severe, and the ulceration of the vesicles considerable, and after they had healed crops of vesicles began to appear, and continued to come out on and off for several months in all parts of the body. The vesicles turned to pustules, and these to small sharp-edged ulcers with inflamed margins, which healed slowly, leaving a depressed scar. My colleague, Mr. Lucas, has had a case under notice where the gangrenous patch was a large one, at the seat of the inoculation, and I have seen two or three others of like character.

Much has been heard of late of the introduction of the syphilitic virus by means of vaccine, and I cannot doubt that such a thing may occasionally happen, but its exceeding rarity, while it should serve to ensure the strictest precautions, may very well be used as an argument in favour of vaccination rather than against it. Moreover, the recent experiments by Dr. Copeman with glycerinated calf lymph seem to show that even this minute risk is dissipated.

CHAPTER XVII.

MUMPS.

Parotitis (Mumps).—Inflammation of the parotid gland occurs under two sets of circumstances. In the one it is secondary to typhoid fever, scarlatina, measles, exhausted conditions associated with a dry mouth, &c., when it usually ends in suppuration; in the other it is a primary acute epidemic and contagious disorder. With the latter we have alone to do now. Mumps appears to be looked at askance by writers on specific fevers. Like whooping-cough, it has such definite local symptoms that there is reason for treating of it as a disease of the part which is specially concerned. But inasmuch as it occurs in epidemics, is very contagious, whilst a second attack is exceedingly rare, there seems very little ground for excluding it from specific diseases.

Incubation.—Fourteen to twenty-five days, according to Dr. Dukes' observations, which are the most complete that I know of. He gives fifty-seven cases of mumps; fifteen of these were not available for the purpose of drawing conclusions. In the other forty-two the incubating period was from sixteen to twenty days in thirty, and possibly in thirty-four. Like most other specific fevers, the period of incubation certainly varies. In a family which I observed myself, a little girl incubated for fourteen days after coming in contact with a child with mumps. The next child took it twenty-one days later, and the third twenty-one days later still. Henoch gives the stage of incubation as about fourteen days; but I think this is too short. Ringer says eight to twenty-two days.

The disease is attended with considerable malaise rather than with downright illness. The child looks very pale, and—on one side or the other, perhaps on both, often commencing on one side (the left, so it is said, more commonly), and extending to the other—there is a tender swelling which occupies the parotid region behind the angle of the jaw, and spreads over the side of the face in the situation of the socia parotidis. Generally the colour of the skin is not altered; but occasionally there may be some redness over the parotid. There is a dull aching pain when the masticatory muscles are moved. The temperature may be a little raised, but in many cases it remains normal. The swelling lasts for four or five days, and then gradually subsides. As regards the constitutional disturbance, there is some variety. The fever may be considerable (103°) for a short time; Dr. Gee has recorded one case of onset with convulsions, and there may be some delirium at night. As regards the swelling, it is not by any means always confined to the parotid; it extends to the submaxillary gland, and also to the cervical lymphatic glands, and may sometimes even be confined to the latter, in which case the disease is likely to be mistaken. Occasionally the swelling is so great as to extend from one side to the other in a huge continuous double chin. When the disease is severe the difficulty of deglutition is considerable, and, the child breathing with its mouth open, the tongue may thus become brown and dry. This is a point which it is important to remember, for the symptom is one which might otherwise lead us to regard the case as of greater anxiety than need be.

The duration of the disease is very variable; five or six days appears to be about the usual limit; the course, however, may be a protracted one, for it sometimes happens that when the swelling has subsided on one side it recommences on the other, and in this manner ten or fourteen days may be occupied.

Complications.—Chief of these is the tendency, a rare one, in males to the occurrence of orchitis. This is often spoken of as a metastasis; and I do not know that there is any objection to the term, inasmuch as the testis usually becomes affected as the parotid swelling subsides, although the two regions may be affected concurrently. Dr. Dukes gives twelve cases in boys: in six the orchitis began on the seventh day; in four on the eighth; in one on the ninth; and one on the *first*. The body of the testis becomes suddenly swollen and intensely painful, and fluid often collects in the tunica vaginalis. The accompanying constitutional disturbance is generally severe, there being high fever and perhaps considerable delirium. All writers record the occasional occurrence also of an homologous affection of ovaries and mammæ; but I suspect that this is one of the statements which is copied from book to book, and is far more imaginary than real. I cannot find any notes of such cases. The occurrence of orchitis in mumps is rare; indeed, it is a disease of adolescents rather than of children. Dr. West has no personal experience of it, and Dr. Dukes considers that it comes only to those who have arrived at or are beyond the age of puberty. I have, however, seen a very severe case in a boy of about twelve. He came under my own care some years ago.

The orchitis usually subsides within a few days; but it may, on the other hand, lead to persistent hydrocele and atrophy of the testis.

Meningitis is another complication described as occurring, but which must be very rare. Possibly a similar remark applies to this as to the ovaritis and mastitis; and it is not unlikely, I think, that the severe delirium which occasionally presents itself in the course of the testicular—and even sometimes of the parotid—inflammation, may by some have been considered evidence of meningeal inflammation.

Sequelæ.—A chronic induration of the gland is sometimes left behind after the attack; but it is of little consequence, and usually cures itself in the lapse of time.

Suppuration of the gland is an occasional but rare sequela.

Morbid Anatomy.—Practically none. Virchow has contended that the disease is a catarrhal affection of the ducts of the parotid gland, and Bamberger states that the whole gland is enlarged, red, and œdematous from interstitial exudation. This is indeed highly probable but facts to corroborate it are very few.

Diagnosis.—I can imagine that in young children the sudden and rapid swelling of the cervical glands from scarlatinal or diphtheritic poison might cause some doubt, but the extreme illness in the one and the less serious state in the other will ere long settle it. On the other hand, the fact that mumps may show itself as an affection of the submaxillary gland or even of the cervical lymphatic glands, and leave the parotid untouched, though such cases are rare, is worth remembering. Lastly, the occurrence of suppuration should make one suspect and examine for some septic state other than that which hypothetically we uppose to be present in an attack of uncomplicated mumps. Ve have seen simple parotitis occur after laparotomy in children s in adults.

Prevention.—The disease is so mild, and so free from equelæ, that it may be a question whether it is worth while o enforce any strict quarantine; but delicate children should aturally be protected as far as may be, and boys when they are ttaining to the age of puberty. It is certainly advisable to void all risk of orchitis. As regards returning to school, four weeks should elapse from the commencement of the illness if all swelling has subsided. When a child who has not had the disease has been in contact with the sick, he must be isolated for a like period, the incubation being a lengthy one.

Treatment.—It often happens that no medicinal treatment is required. The child is kept warm in one room, and its diet is made to conform to its inability to masticate—to consist, that is to say, of milk, broth, custards, jellies, and blancmange. Should there be much fever, a drink may be made of barley-water, to which fifteen or twenty grains of nitrate of potash, and the same quantity of bitartrate, have been added to the pint.

The local pain may be relieved by warm moist applications, such as spongio-piline wrung out of hot water; or by lint, soaked in warm water and covered with oil silk. Chloroform or belladonna may be sprinkled on these, if necessary. Small doses of Dover's powder are also sometimes necessary. If the fever is severe, a drop of tincture of aconite may be given every hour for a few hours.

The child is to be kept indoors for nine or ten days, and some tonic, such as Parrish's food, may be given afterwards. In older children of the male sex and adolescents, particularly the latter —for the older the boy the more likely is there to be orchitis— the child must be kept in bed for eight or nine days, and the temperature carefully watched. Dr. Dukes has found that a rise of temperature is a good premonitory warning of the occurrence of this complication, and that the early application of poultices to the part mitigates the pain and lessens the severity of the affection.

It has been asserted that jaborandi and its alkaloid pilocarpine have the power of arresting mumps if given sufficiently early. I have not had any personal experience of this; but it is worth a trial, always remembering that pilocarpine in children has sometimes acted as a powerful depressant, and should therefore be given with caution in the case of young children. I have given it in acute nephritis to the extent of one-fifteenth up to one-tenth of a grain as a subcutaneous injection to children of ten and twelve years of age, and from the slight effect produced by the lesser dose this might safely be given to children of eight or six years. It can also be given by mouth, and perhaps preferably so, one-eighth to one-fourth of a grain for a dose in a little syrup and water.

In the violent delirium which occasionally happens, I should be disposed to trust to saline aperients and warm baths.

The orchitis is said to require plenty of warmth in the way of fomentations, and baths, but I should be much inclined to try the free application of ice at the onset, in the hope of cutting short the inflammation. The fever is treated either by aconite or saline diaphoretics. The urgent symptoms are not usually of any duration.

CHAPTER XVIII.

WHOOPING-COUGH.

Pertussis.—I shall complete the specific diseases especially incidental to childhood with an account of pertussis. Like mumps, it is always a question with writers whether this malady shall be placed with specific diseases or with those affecting the parts or organs with which the symptoms more particularly concern themselves; but surely, if the disease is specific and possesses infective properties, its most important feature as regards the community is its specific nature—as regards the individual only can the local symptoms claim priority. Since, therefore, the well-being of the community is of the first importance, pertussis, I think, most properly groups with those other diseases which have contagious properties; and, indeed, in this respect, it takes this place more fitly than some others, for next to scarlatina it has the highest mortality of all the diseases of children.

Incubation.—I have but few data of my own from which to fix the period of incubation (in a family of two sisters it appeared to be eight days, the one being exposed to infection, and a cough beginning eight days after, the other following suit eight days later); it is stated to be from four days to a fortnight. This longer period is illustrated by two cases which came under our care:

A boy, aged about eleven years, was playing on July 28 with a little girl who within a few days whooped. He did not see her again. On August 11—*i.e.*, exactly fourteen days later—he began to cough, and the fact that his playmate had whooping-cough aroused suspicion of infection. He was at once sent to the seaside, but the cough persisted, and on September 8 he whooped for the first time. On August 24—*i.e.*, thirteen days after the first symptoms in the boy—his sister, aged nine years, began to cough and was feverish. On September 8 she whooped for the first time.

Dr. Murchison quotes three cases upon the authority of Dr. Bristowe, which are almost free from the possibility of error, and which give a period of incubation of fourteen days.* These cases are so well told, and the information is so precise, that I quote them as they are reported:

> "In the winter of 1874–75, Dr. B.'s three youngest children, owing to having suffered from severe 'colds' in the previous autumn, were kept in the house in London from the early part of December until May, when the following occurrence took place: They were then in perfectly good health, and for several months had seen no children or visitors of any sort. But at that time some nephews and nieces of Dr. B. were ill at Sydenham with whooping-cough. On Saturday, Dr. and Mrs. B. went to dine with his mother, who also resided at Sydenham Hill; and, on arriving, they found the eldest boy of the family referred to living with her. He had hitherto escaped the disease, and was living with his grandmother in the hope that he might escape it altogether; but on this very Saturday he had, for the first time, a constant troublesome cough. Mrs. B., being afraid on account of her own children, and believing that the boy was in the early stage of whooping-cough, did all she could to avoid him; but he clung to her the whole evening, climbing on her knee, and coughing and sneezing over her. When she got home at night she took off her dress and laid it over an ottoman under a window in the dressing-room, intending next morning to have it hung out in the open air. Unfortunately, however, the eldest of the three children referred to came into the dressing-room early next morning, and began playing at the window over the dress. As soon as this was noticed, she was sent away, and the dress was carried out of doors. Exactly thirteen days afterwards, on the Saturday, this little girl appeared to have caught a bad cold, and ten days later she began to whoop. The two youngest children caught the disease from her, and both sickened about a fortnight after she first showed signs of illness. The seven other children in the family escaped, but they had had whooping-cough before.

Probably here, as in other infective diseases, the incubative stage is a variable one, depending upon the conditions, both atmospheric and individual, under which the poison or germ is cultivated.

The disease has almost always been described as one of three stages, but there is no true third stage. There is a primary stage of catarrh and fever, and a second of the paroxysmal cough: but for a third it is necessary to fix an arbitrary limit where the disease does not define any. The distinction between the *two* stages is of importance, not only because of its clear definition, but because some of the remedies applicable in the second stage are harmful in the first.

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* "Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases," *Trans. Clin. Soc.*, vol. xi. p. 238, &c.

In the first stage, which lasts a week or ten days, the child is poorly, with moderate pyrexia and a hoarse, dry cough, sometimes with a peculiarity of *timbre* which has been called "ringing." As with other febrile conditions, the child may be pretty well during the day, with good appetite, or have its fits of fretfulness and cough, with loss of appetite. Probably the more or less of these symptoms depends upon the extent to which the fever runs. Auscultation at this stage usually reveals more or less bronchitis of the larger tubes, indicated by moist and dry bronchial râles, but there is little or no visible secretion from the bronchial tubes. As the catarrhal stage proceeds, the cough becomes more noisy and paroxysmal, with nocturnal exacerbations, and the face a little full-looking with the eyes suffused, an appearance which to a careful observer may suggest what is coming. The whoop appears towards the end of the second week, or later. As I have watched it mostly in severe cases, and with the child in bed, the onset of a paroxysm has been quite sudden, a short series of rapid expiratory coughs; but should the child be up and about, it often becomes restless for some few seconds or minutes before, and may even run to its nurse or mother for support. But from some observations which Dr. Newnham was kind enough to make for me in the whooping-cough ward at the Evelina Hospital, it appears that in some it begins thus, and in others with a deep inspiration. In either case the first expiratory part is short, and followed by a short whoop, to be quickly succeeded by a longer series of similar short expiratory efforts to those at the onset, and a second and longer whoop, when the paroxysm may be over, or a third and a fourth may succeed, until the child is fairly exhausted. The paroxysm, short or long, terminates with a flatulent eructation and vomiting—a quantity of stringy mucus and food being ejected, often mixed with a little bright blood. The frequent repetition of the cough produces, in many cases, a characteristic appearance of face which cannot be mistaken; the features are swollen or puffy, and dusky in colour, not unlike, as far as the tinge is concerned, the aspect of a case of typhus. The eyes are watery-looking, and dusky in like manner, an appearance due, as is the colour of the skin, to numerous minute ecchymoses or to congestion of the smaller capillaries. In many cases there are extravasations of blood beneath the conjunctiva, which, of course, hardly admit of mistake. If examined during this stage, the chest has little to tell, provided there is no broncho-pneumonia—a few râles, dry or moist, may be heard here and there, nothing more. The spasmodic stage of whooping-cough has no definite duration, and varies much in intensity. In severe cases there may be twenty to thirty paroxysms in the course of the twenty-four hours, or even more. At the Evelina Hospital, where all cases are recorded upon a chart, it is found that some paroxysms are accompanied by a whoop; some are not; and that sometimes one, sometimes the other, kind predominates. A typical case one would suppose, should show an onset of paroxysms without whoop, gradually lessening in number; paroxysms with whoop to replace them; these again gradually declining and being replaced by a gradually lessening paroxysmal cough without whoop. But, as a matter of fact, it can hardly be said that this is so, the varieties are so many. Very young children often do not whoop. It is sufficient to know that they have fits of coughing, followed by sickness, and usually with some puffiness under the eyes. Children who are very ill with broncho-pneumonia often do not whoop; and in the declining stage there is much of habit in the paroxysmal nature of the cough, so much so that, as is well known, it is of frequent occurrence that, months after its cessation, the cough returns again, perhaps more than once, with nearly characteristic features, under the stimulus of some perfectly neutral catarrh.

As regards the nature of the whoop, there has, at one time or another, been much discussion, but it appears to me that too much attention has been paid to it. The whoop is the natural consequence of the paroxysmal cough, and is probably facilitated by the flexibility of the laryngeal cartilages in young life. The nearest approach to the cough of whooping-cough is the sudden paroxysm induced by food (usually fluid) getting into the rima glottidis. We have there the remarkably sudden onset of a number of rapidly succeeding expiratory efforts, till the face becomes turgid, the eyeballs almost starting, and the eyes run with tears. In some cases a mild whoop is not uncommon, and is clearly then the sound produced by the influx of air through parts which are not prepared to allow it to pass readily. Whether they are actually in a state of spasm seems to me to be doubtful—all that is requisite appears to be some want of harmony in the laryngeal muscles such as would produce at any rate a relative incapacity in the size of the conduit to the thoracic cavity, which needs, having been emptied to an extraordinary degree, to be filled with more than usual rapidity. There are also other cases which bear upon the whoop—viz., such as frequently make an inspiratory crow. There are some babies who, under the stimulus of any sudden excitement, such as waking from sleep, or suddenly being carried from a warm room to cold air, produce a well-marked inspiratory crow, not so noisy as in pertussis, but still surely of like nature (*vide* chap. xxii.). I have always thought that this condition, in a certain proportion of cases, is one incidental to the infant larynx, for it occurs in perfectly healthy children, goes on for many months and then disappears.

Spasm may well aid in accentuating the relative incapacity of the rima for the demand which is made upon it to admit an excessive supply of air in a given time, but I doubt if the existence of spasm is a necessity for the production of the whoop. From this it follows that the essential of the disease is not the whoop, but the rapid series of expiratory coughs, or, to speak more correctly, the stimulus by which this discharging force is set going. Whooping-cough is a disease that is very liable to febrile and catarrhal relapses. The early catarrh and fever may have all subsided for many days, when suddenly the child again becomes poorly with sharp fever and a chest full of râles.

As regards other symptoms, I will only allude to the statements that have been made concerning ulceration of the frænum linguæ, and increase of dulness over the root of the lungs and behind the sternum, as indicative of enlargement of the bronchial glands. Neither is of any real help, the ulceration of the frænum occurring chiefly in cases where the character of the cough leaves no doubt, and the existence of abnormal dulness in the regions indicated being, according to my experience—and I have made a frequent practice of testing the statement—exceedingly rare and equivocal. Whooping-cough, if of any ordinary severity, is usually accompanied by wasting, and in bad cases the emaciation is sometimes excessive.

The duration of the disease is very variable: six to eight weeks is said to be the usual time. Of 126 cases of my own, those lasting three weeks number 7; four weeks, 15; five, 6; six, 13; seven, 12; eight, 16; nine, 8; ten, 13; eleven, 4; twelve, 12; and those over twelve weeks up to twenty are twenty in all.

The age at which it occurs most often is between two and six, the exact figures in 314 cases being—

Three months and under	9
Six " "	23
One year "	30
Two years "	60
Three " "	60
Four " "	54
Five " "	38
Six " "	27
Seven " "	7
Eight " "	2
Nine " "	3
Ten " "	1
Total	314

The mortality amounted to twenty-four males and sixteen females, a total of forty, of the 314, or about 12 per cent.; but this is really too high for a general average, because it includes all cases, whether in-patients or out-patients, and of the in-patients naturally the larger proportion are severe cases with much broncho-pneumonia. If the two classes of cases be separated, the mortality amongst the in-patients rises to 40 per cent., that amongst the out-patients falls to 9 per cent. The ages of the fatal cases well illustrate the rule that the younger the child the greater the risk. Ten were under six months old, four others under a year, twelve between one and two years, seven from two to three, four from three to four, two from four to five; one child died at nine and a half of a very lingering broncho-pneumonia, probably of destructive nature. Thus in thirty-three out of forty deaths the children were under three years of age.

As regards the causes of death, five and twenty died of broncho-pneumonia; in three of the cases convulsions were super-added; six others had convulsions; the remaining nine died under various conditions, of which I may note a drowsy state, probably associated with atelectasis and wasting, which I suspect is not uncommon. Henoch gives an accurate account of cases such as this: they occur in young children under a year with apnœa, cyanosis, occasional evidence of bronchitis and broncho-pneumonia, contraction of the fingers and toes, and occasionally convulsions. He mentions also that occasionally in the complexity of symptoms they simulate very closely cases of tubercular meningitis. While upon the subject of the mortality from whooping-cough, I may add that, inasmuch as the estimate is drawn from the immediate cause of death, the rate falls, no doubt, far short of the reality, for, though it is difficult to prove the fact, whooping-cough is a fertile source of caseous disease of the bronchial glands and tuberculosis, and of dilated bronchial tubes with all the chronic ills of lungs and heart which are associated therewith.

Modifications.—Pertussis is a disease which shows much variety—it may be very mild, so as hardly to be recognisable, or it may be very severe. Either stage may vary; the febrile onset being excessive or prolonged and obscuring the paroxysmal; or the initial stage may be hardly noticeable and the whoop the first thing to attract attention. There may be much pneumonia or none at all; and as regards other symptoms there may be much or little hæmoptysis—much or little vomiting—much or little wasting. The hæmoptysis and vomiting are in proportion to the violence of the cough, and the wasting is in proportion to the vomiting. In very severe cases the whoop disappears altogether, and the cough is associated with an amount of laryngeal obstruction so as to resemble laryngismus. Such cases are liable to general convulsions, and are very dangerous.

Complications.—I shall only mention epistaxis, hæmoptysis, ulceration of the frænum linguæ, convulsions, and broncho-pneumonia; pleurisy, pericarditis, and laryngitis. Of these, convulsions and broncho-pneumonia alone are of importance. Hæmorrhage from the nose, mouth, or lungs, and *à fortiori* from the ear—which is mentioned by writers as an occasional occurrence—is never so profuse as to cause any anxiety, and ulceration of the frænum linguæ is hardly worth a note. It occurs occasionally.* I have noted its presence four times in twenty-two cases. It is an indication of a violent cough, and is probably due to the fretting of the frænum against the lower incisor teeth. Epistaxis of some severity I have noted as occurring thirteen times in the 314 cases, though doubtless, in minor degrees, it is present far more commonly than that; hæmoptysis is excessively common. Convulsions constitute an element of great gravity; they are mostly present in young children, or are associated with severe broncho-pneumonia. Of nine cases, six were children of a few weeks or months only—one nine weeks, one twenty months, one eighteen months, one five months, one seven months, one a "baby." The other three were cases of broncho-pneumonia with convulsions supervening, and probably causing death. We have twice at least seen hemiplegia after convulsions which followed a severe paroxysm of whooping-cough. In some children a profound stupor takes the place of convulsions, and, if possible, is of even graver significance.

Broncho-pneumonia is met with in every variety as regards its degree and the position which the disease occupies in the lungs. As a rule, it is characterised by being widespread. There may be patches of disease about the front of the lungs, more particularly along the anterior edges, or round the nipple. The root of the lung is a favourite spot for all the pneumonias of children, that of pertussis not excepted; and not very uncommonly the disease may be excessive and occupy the greater part of one, or even both, bases. Moreover, it sometimes happens that a somewhat extensive pneumonia rapidly clears up. For instance, I had a child aged two under my care in the hospital. There was extensive consolidation at both bases indicated by loud tubular breathing and other signs; the greater part had cleared in five days. On the other hand, broncho-pneumonia is also exceedingly likely to become chronic in pertussis, and in young children the middle lobe of the right lung appears, for some reason or other, to be particularly prone to slowness of repair. This lobe is very liable to pass into a solid condensed state of leaden colour, and on section to be studded over with crenated patches of caseous pneumonia, each with a dilated bronchial tube in the centre full of thick pus, or actually softening into a cavity. Pleurisy is naturally not infrequently associated with whooping-cough, mostly by extension from patches of pneumonic consolidation; and pericarditis, when it occurs (I think but seldom), probably originates in a similar manner by direct extension. Laryngitis I have noticed as occurring in five cases, but in none has it been of any severity.

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* *See* also p. 161.

Results and Sequelæ.—Emaciation may very properly be considered as a result of pertussis, for several reasons. In itself it is no unimportant condition that a child should be little more than a skin-covered skeleton. The viscera under such circumstances must run the risk of various forms of degeneration, and it might naturally be supposed that nutrition so bad would dispose towards cheesy changes in the glands and a secondary tuberculosis; that such is actually the case many have very little doubt.

Atelectasis, or collapse of the lung, is another important consequence: important in itself, as being in young children extensive, and causing death; important in the further trouble it entails, of broncho-pneumonia, emphysema, and dilatation of the bronchial tubes, all which results come about very naturally from the collapse. The whooping-cough is associated with more or less bronchitis, and this with more or less secretion in the smaller bronchial tubes. The air is driven from the pulmonary parenchyma by the expiratory efforts, and, unable to return by reason of the plugs in the tubes, the lung becomes collapsed in various parts. The collapse leads to inflammatory processes in the lung, and the tubes of the part become dilated —very often a little pleurisy forms on the surface of these patches, and perhaps also some adhesion follows, which tends to increase the bronchial dilatation.

Thus it is that after a bad attack of whooping-cough the child often remains delicate, with a small and laterally flattened chest, the lower ribs being expanded over the abdominal viscera, and causing that disproportion between the abdomen and thorax which is so common a result of atelectasis.

The relation of **cheesy bronchial glands** and **phthisis** to pertussis is no doubt a question of much difficulty, for it is not only difficult to obtain the direct proof when one disease succeeds another at some considerable interval of time, but it is also impossible in many cases to free this question from others; such as the effect of intercurrent or concurrent measles; of hereditary taint; constitutional predisposition, &c. Nevertheless, I feel sure, and there are many who think likewise, that, both on the ground of probability and on the ground of fact, pertussis is a frequent source both of cheesy glands and tuberculosis. That such occurrences are probable is only too evident when we remember the bronchitis, the broncho-pneumonia, the swelling of the bronchial glands, that accompany the disease so often; and on the ground of fact, we are all unfortunately too familiar with many cases where cheesy bronchial glands, cheesy pneumonia, and disseminated tubercle in the lungs and viscera have succeeded pertussis, to have less than an almost positive conviction. And I believe it will be worth while to remember, when after pertussis the child remains wasted for a long time, and the cough still preserves its paroxysmal character, it may be for months after the attack, that the case should be very carefully scrutinised from all points with reference to settling the question of the existence of glandular disease. It is possible, too, that the importance of **nephritis** as a sequela of pertussis may have been overlooked. Dr. Stefano Mircoli states that in 1887 of ten children, two had nephritis and one died—and a year later, of thirty-five cases four had it and *two* died. But the albuminuria which is occasionally seen in whooping-cough during the paroxysmal stage is probably due in most cases rather to venous congestion than to nephritis; we have once or twice seen the urine bright red with blood in whooping-cough.

Etiology and Pathology.—It is a disease which is said to be more common in females than in males; but my own figures make this doubtful—136 out of 282 cases being males, or very nearly half. It is said also to be more frequent in the spring months; but neither does this appear very decidedly in my series, although the statement is probably correct. The excess of mortality in the winter months is undoubted.

It is a disease which occurs in epidemics, and it is unquestionably contagious, the contagion being capable of transmission from one child to another by articles of clothing without any actual contact of the diseased with the healthy. It is also protective against any recurrence. Thus it has all the characteristics of a germ disease, although what may be the nature of the virus we as yet know not. It is usually supposed that the germ, which some have thought they have discovered in micrococci or bacilli in the respired air and in the bronchial mucus, acts locally upon the mucous membrane of the respiratory tract, and thus leads to the pulmonary phenomena which have been described. But this view fails to account satisfactorily for the neurotic element of the disease, and, on the whole, I think it best to say that diphtheria is the disease with which it has most analogies. Diphtheria is unquestionably a blood disease, and, it tends to fasten itself upon the throat, and it is also followed by a nerve lesion which must be definitely localised, if we are to judge from the uniform character of the paralytic symptoms. Whooping-cough behaves in much the same manner. In the first place, it would seem to be a blood disease, as evidenced by fever at the onset and the catarrhal stage; and in the next place, the virus expends itself in part on the respiratory *centre* and thus brings about a nerve discharge, which ends in the expiratory cough—and in part upon the pulmonary surface, leading to the swelling of the mucous membrane, the bronchitis, the pneumonia, and the swelling of the bronchial glands. Given these two sets of conditions, no doubt the one tends to intensify the other; the over-sensitive bronchial surface will provoke nerve discharge, and the nerve discharge will tend to increase the peripheral disturbance. The difficulty in the way of acknowledging the specific nature of pertussis—and that there is a difficulty is shown by the fact that some even yet call it a neurosis, and refuse to it any specific nature, while others feel there is something peculiar in its behaviour which makes its presence incongruous in any group of diseases—seems to me to be in the impossibility of fixing what is the limit of the vitality of the contagion. In most of the specific fevers we have been able to fix some limit from the behaviour of the disease; but to pertussis there is none; it lasts mostly six weeks to two months, but the whoop may continue long after that. All that can be said of it in this respect is that it is most contagious in the early stages, but the virus appears to lack a definite life history.

One cannot argue against the specific nature of the disease from the absence of fever, and the tendency to recurrence of a non-contagious cough; diphtheria sometimes causes but little fever, and its nerve lesion is apparently but an epiphenomenon. The cough of pertussis is started by the disease, but soon tends to become a habit, and thus to return again and again, until it dies out in the oblivion engendered by more healthy and regulated discharges of nervous energy. And it will be quite impossible to arrive at any conclusion upon the natural history of pertussis germs until we leave the whoop out of our calculations altogether and pay more attention to the catarrhal stage.

Dr. Sturges argues for a somewhat similar end, albeit that his line is not quite the same. He would, as I would, separate the two elements of the disease into (1) epidemic catarrh and (2) convulsive cough. The latter he considers to be a feature of cough in childhood from all sorts of conditions, and having nothing in it of a contagious character save that of nervous mimicry. Whatever is specific, and whatever in the zymotic sense is infectious, Dr. Sturges considers to reside not in the cough but in the catarrh. Any child suffering from catarrh is liable to develop convulsive cough, and the rapid spread of convulsive cough is a sign and measure of epidemic catarrh. I think this hypothesis comes nearer the truth than any other yet put forward, for while doing no violence to any known facts, it explains some of the anomalous traits of the disease. I am inclined to think, for instance, that it not only explains the relationship which exists between measles and whooping-cough, but that the relationship itself lends support to the view if, as I think, the whooping-cough usually follows the outbreak of measles (*see* p. 182). Nor need I point out at any length how it falls in with the difficulty there is in fixing the limits of the life of the germ, and the duration, therefore, of its infective power, for I suppose there are few who doubt the contagious property of "a cold," if I may use so vague a term, and few who would dare to define its vitality in this respect.

Dr. Sturges further supports his arguments by appealing to an observation he has made at the Great Ormond Street Hospital, and the correctness of which we, too, at the Evelina, have often had occasion to remark, that although cases of pertussis are not infrequently admitted into the general wards in the stage of catarrh and remain there often for several days—until, in fact, the case declares itself by the whoop—nevertheless, the disease is very seldom conveyed to other children. But this may mean no more than that the zymotic element is less active or diffusible than those of other infectious diseases.

Quarantine.—A child may go to school in six weeks from the commencement of the whoop, provided that the paroxysmal cough has ceased. Children who have come in the way of contagion must be kept apart from others for a fortnight. It is, however, probable that this quarantine is more than is really necessary. I have long believed and taught that the infective stage of pertussis is the catarrhal stage, and this only; once this has ceased the whooping stage is not so. Weil (*Lyon Médicale*, May 19, 1897) has put this to the test. On various occasions he allowed nearly one hundred children who had never had the disease to be associated in a ward for three weeks or more with children in the whooping stage. And in only one case was the disease contracted, and that from a child in the earliest stage of whooping—when therefore the catarrhal state may still have existed. Weil has satisfied himself that in some cases infection was conveyed by children who had not begun to whoop.

Morbid Anatomy.—The actual lesions found in whooping-cough are not many. Of chief importance, at any rate as a cause of death, is broncho-pneumonia. This shows itself in children by more or less wedge-shaped patches of solid, perhaps tough, leaden-coloured lung, in which the vessels and tubes stand out prominently, and the latter are often dilated. If the diseased part is large there will be seen, in addition, ill-defined areas of redder or paler colours, dotting it over, perhaps, with a rather sandy or granular appearance. It is common to find the greater part of one or both lower lobes affected in this way, or the parts about the roots of the lungs, and spreading outwards in the middle zone quite to the surface. The parts of the lungs corresponding to the mammary region are particularly liable to be affected, and thus to lead the unwary to conclude that he is dealing with a secondary phthisis. The bronchial tubes contain a thick glairy muco-pus, and the mucous membrane of the trachea and larynx are often injected or even minutely ecchymosed. The margins of the lungs are usually emphysematous. As regards the bronchial glands, there can be no doubt that they are liable to acute swelling; but the number of children dying of a perfectly uncomplicated pertussis is not large, and in many cases the swelling that is found is the natural result of broncho-pneumonia.

Various cerebral conditions have been described, such as congestion, œdema, serous effusion, and the like; but they are all of very doubtful significance; ecchymosis or, in some cases, larger extravasations of blood, such as to have deserved the name of "meningeal apoplexy," can alone be said with certainty to have been due to this disease.

In chronic cases other lesions are found; the broncho-pneumonia undergoes degenerate changes, which convert it either into solid cheesy masses or isolated nodules with softening centres. The bronchial tubes become more dilated, and in many cases a disseminated tuberculosis of the lungs takes place. The bronchial glands are also liable to lose their red, swollen, fleshy appearance, and become converted into masses of firm yellow cheesy substance like those in the lung. The explanation of these further changes is not hard to discover. Catarrhal pneumonia is well known to present under many circumstances a tendency to such degenerations, and the chronic disturbance of the respiratory tract, which we recognise as chronic bronchitis, is only too likely to perpetuate the initial hyperplasia of the bronchial glands and to lead to their caseation and to the development of acute tuberculosis of the lungs and viscera, or to an acute tubercular meningitis.

Diagnosis.—There can be very little difficulty as regards the whooping stage; but it may be as well to insist particularly, although, to a certain extent, it follows from the remarks already made upon the nature of the whoop, that the peculiar cough may return again and again upon trivial excitement. Further than this, it is allowed by all writers that chronic diseases of the bronchial glands sometimes produce a noisy paroxysmal cough very like pertussis. The distinction will be in the absence of any definite stages; the absence of any evidence of infection—such cases occurring sporadically and not in epidemics; some deviation or other from the typical whoop; the evidence of associated lung disease; possibly symptoms of spasmodic asthma; and a history of wasting long before the occurrence of the cough. A foreign body in the air-passages sometimes gives rise to a paroxysmal cough which may simulate pertussis.

In the catarrhal stage, however, there may be considerable difficulty. Indeed, in many cases, we can only have our suspicions and act accordingly, watching in individual cases for a confirmation of the diagnosis in the onset of the paroxysmal cough. Here, as in so many other conditions, to be forewarned and on the look-out is a better preparation against mistake than a *memoria technica* of phenomena, any one of which, or all, may fail us when doubts arise and we come to test them.

Prognosis.—In very young children (under a year old) the disease is always a cause of anxiety; but in uncomplicated whooping-cough at four or five years of age the mortality is not large. The gravity of the case will depend upon the complications that may arise. If there should be much broncho-pneumonia, naturally the danger will be great; so also if convulsions are severe. Then, again, if the child is rachitic and the chest-walls retracted, the occurrence of whooping-cough will tend to increase the already existing collapse and bronchitis and to set up pneumonia, and the risk increases in proportion.

The frequency with which complications occur must vary, no doubt, in the practice of individuals; but it may be as well to state that Meigs and Pepper give, as the results of their practice, 65 cases associated with complications out of 208, or nearly one-third. Of 320 cases of my own, 57 had broncho-pneumonia or bad bronchitis; 16 others, various other complications. Probably, therefore, from a fourth to a third of the cases may be expected to be complicated in some way, varying somewhat with the epidemic influence and the time of year at which the cough occurs. Atmospheric changes have a most important bearing upon pertussis. It has been repeatedly noticed in the whooping-cough ward at the Evelina Hospital that the children are worse, even when otherwise doing well, when the wind turns cold or suddenly changes; and it is notorious that the disease runs a much less determined and persistent course in summer than in the colder seasons of the year—or, to put it in conformity with Dr. Sturges' hypothesis, at times when epidemic catarrh is not prevalent.

Lastly, I would say again, beware of too hastily assuming the existence of phthisis where the broncho-pneumonia runs a chronic course; for it is noteworthy that not a few cases with pronounced signs of chronic consolidation of various parts of the lungs and extreme emaciation, ultimately—and sometimes rapidly—mend and become completely restored to health.

Treatment.—This is a very important part of the subject, if it be true, as is said, that this is the most fatal of all diseases of children under one year. Some people think and teach that whooping-cough will run its course and gradually wear itself out, and that no drugs influence it materially. Some deny to it any specific virus, and consider it merely a nervous trick associated with catarrh, and, just as some tricks are easily caught in childhood, so, they say, is the whoop of whooping-cough. It is, no doubt, a disease in which, until trial has been made, it is difficult to say what drug will act best in any particular case. But that there are drugs which are of decided use I have no doubt whatever; and there are, moreover, other points in the treatment with which it will be well to make oneself acquainted. In the first place, let it be again repeated that whooping-cough is generally a disease of two stages; there is the primary catarrhal stage—in which the child is feverish and ill; and there is the after or whooping stage—in which the child may not be ill at all, though this, of course, will necessarily depend upon the severity of the disease.

Catarrhal Stage.—As I have already said, hitherto attention has been mostly directed to the arrest of the whoop. But, just as in a common "cold," remedies seem to do little when the coryza is well set, so here, if we are ever to do anything to cut short the disease, it must be by attacking it in the early stage. There is no reason that I know of why we may not some day find a specific for the catarrhal stage of pertussis, as quinine is for ague, mercury for syphilis, or arsenic for some forms of skin disease. And with this end in view I have tried various forms of antiseptics, and some, I think, not without benefit. First to hand was salicylate of soda, but of any good results I am in doubt. Carbolic acid given internally is perhaps sometimes of use; a minim or more, according to age, of the glycerine of carbolic acid may be given at intervals of three or four hours. From its action as a vapour I cannot say that I have seen any benefit. For some time we impregnated the air of our whooping-cough ward at the Evelina strongly with it; little effect upon the disease could be perceived; and obtained, as we obtained it, from vaporising the lotion, it was expensive. The more economical way of carrying out this treatment is to obtain the vapour from Calvert's *powder* by means of the small tin lamp and dish sold for that purpose by the manufacturers. Cresoline gives a similar sort of vapour—we have tried it without definite results; I think more highly of trochisques Vichot,* first recommended to me by Mr. Benjamin Duke. These are pastiles of some creosote compound, and, vaporised within a tent three or four times a day, they compel a prolonged and more concentrated inhalation, and appear to be sometimes useful. For a year all our cases were treated by a frequent resorcin swab; a 1 per cent. solution in water was painted on the throat every three hours. This drug has been strongly advocated by Moncorvo, on the hypothesis that the germs of the disease reside in the epithelial cells of the mucous membrane of the larynx and pharynx. Good results have been obtained from the treatment by Dr. W. H. Barlow of Manchester. I think upon the whole the cases have done well, but in no case could it be said that we have as yet reached perfection, for the average duration of the disease has been hardly short of that of former years. Of late in several isolated cases I have used Monti's treatment by nasal insufflation. Two to three grains of powdered benzoin or boric acid are blown up the nose by some efficient insufflator every three hours or oftener during the day, and once or twice at night. I think this plan also sometimes of decided value. Some time ago I tried paraffin oil, and apparently with good results. For some months all, or nearly all, uncomplicated cases of pertussis that came to the out-patient room were given five to ten drops in syrup and water, and many had previously taken other remedies without avail. The cough in many became less frequent and less violent. The one objection is that the smell and taste of paraffin cannot be disguised, and that it occasionally causes sickness. Within the last year or two I have tried antipyrin, and it certainly in some bad cases has controlled the paroxysms in a most definite manner. I have only tried it in children of seven years and upwards, and have generally given five grains for a dose three times a day. Such are some of the remedies that have received a more or less general certificate of usefulness in this particular domain. I often hear or see this one or that lauded more enthusiastically than I can do, because we have found that remedies that have proved useful in private practice or in the out-patient room, when tested in a ward set apart for the treatment of the disease in hospital, and by the more rigid appeal to facts thus allowed, have given results of much more equivocal nature. At the same time it is only proper to remark that too much must not be made of this. It is true that pertussis is notoriously uncertain in its behaviour, and thus may seem to do well under the influence of a drug that has in reality done little or nothing. But, on the other hand, those who are most certain of the value of drugs are those who see the disease in its earliest stages, and therefore at the very time when, as I have already insisted, remedies of a particular kind are the most likely to act with effect. The average run of cases in a whooping-cough ward are bad ones with much broncho-pneumonia, and in many respects deterrent to the free action of any drug.

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* To be obtained of Roberts & Co., 76 New Bond Street.

In addition to remedies of the germicide class there are others, old-fashioned perhaps, yet still of undoubted value. There are few remedies of more value than simple **expectorants.** I give the mist. oxymellis co. of the Guy's Pharmacopœia, which consists of ipecacuanha wine, compound tincture of camphor, nitrate of potash, and oxymel. Sometimes, if the child is four or five years old, the paregoric alone is sufficient, the benzoic acid and opium of which make it a good sedative expectorant. Often a little dilute nitric acid proves useful. Some have suggested this as a specific for whooping-cough; and, though it is impossible to endorse this view, some children seem to be relieved by its use, and with syrup, and perhaps a little tolu, it does not make a bad mixture for a child to take.

Whooping Stage.—Here also many remedies have been suggested, and I think I have tried most of them. There is no drug that will certainly cut short the disease in a majority of any series of cases taken as they occur. Some will appear to do this for scattered cases in any series, and several are of considerable value in controlling it. Far before all others I must, as most others have done, place **belladonna.** This drug has been recommended very strongly by Trousseau, and it is one of which many think highly, though some think it of no value. I cannot doubt that it is often very effective; but chiefly so when it is given in large doses. Trousseau advises the use of the extract of belladonna given in the morning as a single dose, beginning with one-third of a grain and gradually increasing it. I confess, however, to having a liking for the tincture or the solution of sulphate of atropine. These are more manipulable, whilst the dose of either can be readily increased, and it is essential to the treatment that considerable doses should be administered if the remedy is to do good. Many advise that the drug should be pushed until it produces some known physiological effect. I doubt if this be necessary. Children are very tolerant of belladonna, and the cough is generally controlled some time short of any poisonous effect. At any rate, my own experience undoubtedly corroborates that of most other observers as to the good effects of the drug, although I cannot recall to mind more than one or two instances, and those of children in hospital, where any physiological effect (dilatation of the pupil) has been produced. As regards the actual dose, six or eight drops of the tincture may be given to a child three years old to commence with, and the quantity increased up to twelve drops or more if necessary, and this every three or four hours. Even in very young children large doses may be given with advantage; I have given ten drops (of the B.P. 1885 tincture) three times daily to a child of five months old, and no dilatation of the pupils resulted. This child began at fourteen weeks with four minims, the dose was then increased to six, afterwards to eight, and then to ten drops; infants of five or six weeks old will take two or three minims of the B.P. 1898 tincture without ill effect, and with relief to the violence of the cough.

But as regards the tolerance of belladonna which children exhibit, let me say this much, that, although it is undoubted, I believe it always wise to feel one's way, and to watch the effects carefully. I am no advocate for giving a thumping dose offhand. It is best to begin with some dose proportionate to the age, two or three drops in babies, and five, six, eight, or even ten for older children, and watch the effect. Should it control the cough—well, what need to increase the strength? If not, let the dose be increased drop by drop till it does so or fails, when something else must be tried.* Some prefer to give it in small doses at more frequent intervals, and there is much to be said in favour of this plan on the score of scientific therapeutics. But, except in hospitals with trained nurses, it is difficult so to work it as to run no risk, unless the child's attendants be exceptionally furnished with medical intelligence. But, however given, it will undoubtedly relieve many cases, and appear to stop some. There are many other drugs which are also useful. Quinine certainly does some cases good, but it requires, like belladonna, to be given in somewhat large doses. I have given as much as five grains to a child three times a day, and American physicians give much larger doses when necessary. Creosote in doses of a quarter to one minim, according to the age, sometimes has a good effect; it may be given in a mucilage mixture, flavoured with peppermint-water; the castor-oil mixture (F. 4) makes a convenient vehicle where the bowels are also loose, as often happens in whooping-cough. **Alkalies** are also very useful. The bi-carbonate of potash, in doses of a few grains every few hours, is strongly recommended by Meigs and Pepper as useful in their hands and that of others; and I am convinced that the combination of bi-carbonate of soda and belladonna, a mixture that has long been in vogue at the Evelina Hospital, is a valuable combination. **Alum** is a remedy which may perhaps be mentioned next, because though it is in some cases singularly useful, its action is probably the opposite of the alkaline carbonates. They possibly aid by facilitating expectoration—the use of alum, on the contrary, is said to be indicated when there is already an excessive secretion from the bronchial tubes; but, having tried it with this special object, I feel free to confess a considerable doubt as to having ever accomplished the end aimed at, though as to the occasional control exercised by the drug over the disease I have no doubt whatever. Then, again, the **bromides** of ammonium and potassium and **chloral** are highly useful in some cases; citrophen also and antipyrin are sometimes very successful. Bromoform although it controls the paroxysms to some extent has seemed to us less satisfactory as it is liable to settle down at the bottom of the bottle, and in this way serious poisoning may result from the last dose or two; it may be used in doses of two to four minims; succus hyoscyami in doses of ten to twenty minims, heroin in doses of a sixtieth of a grain cautiously increased up to a fortieth for children of six to twelve years of age, these and many other things are useful in their turn, and indeed, there is much about the treatment of pertussis which brings out clearly the neurotic element; for, like epilepsy, it would appear that there are many drugs which avail for a time or for individual cases, but in the long run and when critically surveyed, seem to have but little advantage over others.

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* See also p. 13.

But there are other important points in treatment which are not less worthy of note. Whooping-cough is a disease which, in most cases, is attended by frequent vomiting, for which, by-the-bye, Dr. Lewis Marshall tells me that he finds the oxalate of cerium useful. The paroxysms of coughing will come on twelve, fifteen, twenty times in the course of the day, and each time very likely will end with vomiting. It is, therefore, easy to understand that nutrition is in some cases much interfered with, and the child becomes much emaciated—it is, in fact, starved. In these cases the most watchful care is required, and the routine must be entirely subservient to this one exigency; the food should be entirely fluid and highly nutritious; in some cases it may with advantage be artificially digested, and it must be given very often, a little at a time; for this purpose beef-juice is very useful in bad cases. Moreover, food should always be administered directly after sickness, so that as long a time as possible may be obtained for absorption before the contents of the stomach are again rejected. By this means a good deal may be done to combat excessive wasting, and in averting this we, no doubt, do the best that can be done to ward off those degenerative changes of which mention has already been made.

Of other remedies, let me first mention an occasional **emetic** as very useful in the earlier days of the whooping period. It clears the bronchial tubes of their contained mucus, allows the lungs free play, and in this way, by acting at the periphery, does what can be done to quiet the central instability.

In the later stages, **friction** to the spine is an old remedy that I believe to be useful; and in the chronic whooping-stage few things act so satisfactorily as **change of air.**

Finally, I would repeat that the remedies which are given for the express purpose of controlling the whoop in the second stage are not suitable to the first, but in saying this one expressly reserves the question of specifics. The nervine anti-spasmodics for the second stage are in no sense specifics; they control the violence of the paroxysm, but have no destructive action upon the supposed germ which causes it. But if the disease be due to a germ, and the behaviour of the disease is certainly in some respects, in favour of this view, then it may be hoped, as I have already said, that a specific will one day be found ; and obviously any drug exhibited with such an object must be applicable, in some degree, at any time during the life of the germ.

The treatment of broncho-pneumonia is given under that heading in diseases of the respiratory system.

CHAPTER XIX.

TYPHOID FEVER.

Typhoid Fever.—No period of life is exempt from enteric fever, and cases sometimes occur in infants of but a few months old. Of forty-six cases from my notes, two were under a year old (both being fatal, and the diagnosis verified by an inspection), one under two, two of three and under, two of four, six of five, five of six, six of seven, six of eight, six of nine, seven of ten, and three of eleven years, so that thirty-nine of the forty-six were over four years of age.

Symptoms.—As in adults so in children—fever, rose spots, diarrhœa, enlargement of the spleen, and bronchitis. Nor are children by any means exempt from the tendency seen in adult life to a repetition or relapse of all the symptoms, when the primary fever has completely, or all but, run its course. But the disease is generally milder in children than in young adults; and its more markedly remittent type is notorious. The fever is, generally speaking, of insidious onset. Headache and loss of appetite are first noticed, accompanied, perhaps, by occasional vomiting. Jacobi speaks of chills and somewhat persistent vomiting. Epistaxis is not uncommon. It is characterised often by very few symptoms during the day—except fretfulness—though symptoms of fever, with quick pulse and dry skin, are not wanting to careful observation. Towards evening the face becomes flushed, or a red burning spot surmounts one cheek, the lips become red, and the tongue dry; the child's sleep is restless and disturbed by delirium; towards morning the fever subsides, and hopes are entertained of speedy recovery. Day after day the same history repeats itself, and now, the abdomen is tumid, the spleen is large; there is diarrhœa, and perhaps rose spots appear; there is considerable cough, and the child rapidly becomes emaciated. Sometimes during the afternoon profuse sweating may set in, though without relief to the symptoms. From these remissions the term "**infantile remittent**" takes its rise; they are sometimes very marked and appear to continue throughout the fever, gradually lessening in severity as it runs its course. But this complete picture often fails. The duration of the fever is more variable, diarrhœa may be absent, and the roseola also. Even the splenic enlargement may be wanting, so that the disease is perhaps only established by the temperature chart, with, it may be, the existence of an associated bronchitis.

A large number of cases occur with no distinctive feature of any kind. It is noticed that the child is ill, and its temperature is found to be high—101° to 103°; a more rigorous observation is then instituted, and it is kept in bed. Then it is found that there is continuous fever with evening exacerbations for some days, accompanied by tumidity of the abdomen, and a coated or beefy condition of the tongue. At the end of ten or twelve days there are more marked remissions, or else by some sudden fall the fever ends, and convalescence is established.

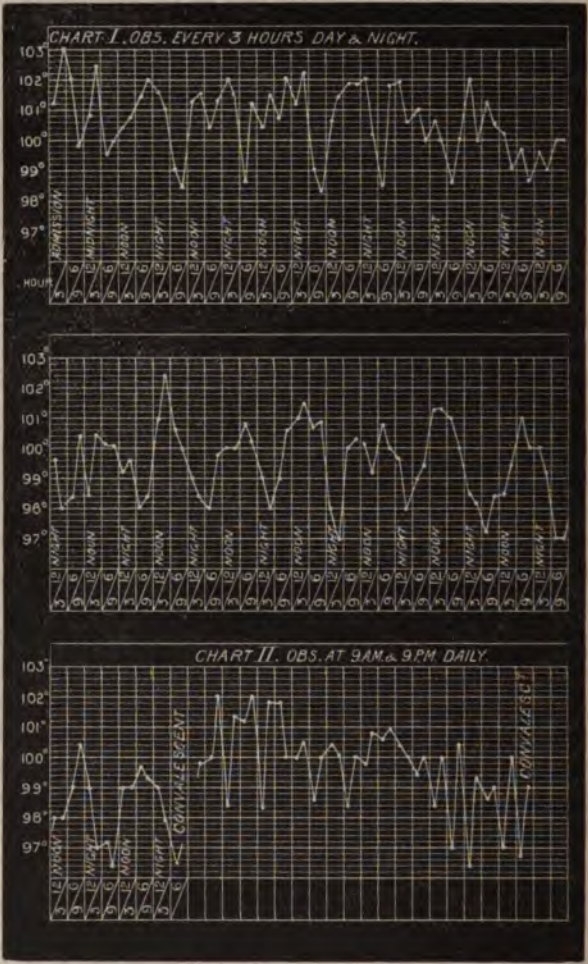
In default of any definite symptoms, there is a disposition to consider cases such as these as instances of mild typhoid. Some German authorities, however—Lebert, for instance—adopt the term **infective gastritis** for febrile attacks of this kind; supposing, in unison with doctrines now in vogue, that the products of gastric catarrh are capable of infecting the system generally, and thus of keeping up a continued fever. The "**gastric fever**" of English authors might usefully be made to convey a like suggestion, but that in common parlance it has come to be synonymous with typhoid fever. I do not wish to assert dogmatically that an infective gastritis distinct from typhoid fever has an existence, but I allude to the possibility of such a thing for the purpose of impressing upon the student that in dealing—as he will often be called upon to do—with continued fever in childhood, of indefinite type, whilst treating it, as he should, with all circumspection, on the chance of the existence of enteric ulceration—he is yet ever to bear in mind that other possible causes than the assumed one have a claim to consideration, and that careful observation and record of all such indefinite types are necessary, in the hope that at some future time some order may be introduced into the at present chaotic domain of "simple continued fever."

Temperature.—In adults the pyrexia of typhoid fever is characterised by a gradual rise in three or four days to the acme of the fever. Next, by a period of continuous fever (103° to 104°), the morning temperature being a degree or so lower than that of the evening; and at the end of the second, or early in the third week, the period of remissions sets in, the morning temperature falling to near the normal line, the evening rise still continuing for some days. In children the same three stages may be noticed, but they are seldom so continuous or so well marked. The remittent nature of the affection is the most prominent feature of infantile typhoid, and may characterise more or less the whole course of the disease. Further, the remissions need present no regularity from day to day in the time of their occurrence. If the temperature be only noted morning and evening, no doubt in the latter it is often high, in the former low; but, taken every two or three hours, the chart will be remarkable for its irregularity, sometimes running up and down several times in the course of twenty-four hours; and the highest point reached may be at any hour, often about 6 P.M., but sometimes 9 P.M., 6 A.M., noon, midnight, 3 A.M., or indeed, any hour. To illustrate these points the subjoined charts are inserted (p. 292). They are both from the same case, the first giving the temperature in the axilla every three hours, the second that at 9 A.M. and 9 P.M. only. I have been at no pains to select this particular one, it is literally the first that came to hand—any one of many others would have done just as well.

The child had been ailing a fortnight or three weeks, but had been vomiting for three or four days, so that she was admitted probably towards the end of the first week of the disease. It proved of moderate severity. Some spots and enlargement of the spleen were present.

All authors appear to have noticed a tendency to the occurrence of two distinct exacerbations about 4 and 9 P.M., with intervening remission and occasional profuse sweating. I also have seen the same thing; the type being malarial or like the hectic of suppuration. The oscillations in these cases are extreme, and if long continued are indicative probably of severity of ulceration. The difference between the lowest and highest temperature for the twenty-four hours should not exceed two, or, at most, three degrees.

During convalescence it sometimes happens that, after the temperature seems to have fallen, a moderate pyrexia recurs, and the chart will show an evening rise of about the same height evening after evening, it may be for several weeks.



Nervous System.—In severe cases there may be a good deal of noisy delirium occasionally showing itself by a frequent harsh cry, and not unlike that of tubercular meningitis, and very perplexing for diagnosis; in cases of moderate severity the child lies stupefied and apathetic, with more or less mild delirium at night. Deafness is not uncommon. Rigors occur but rarely in the course of typhoid in children; we have seen them occur without any apparent cause, but they should always suggest the possibility of some localised inflammation in the ear or elsewhere.

Rose spots have been present in the majority of cases that have been under observation at the proper time. To determine their presence it is necessary to examine the entire trunk day by day. But many children among the poorer classes are only brought to the hospital at the last stage of the disease for continued ailing or emaciation, which is thought by the parents to indicate consumption. In many of such the rose spots are absent. They are absent throughout in perhaps a fourth of all the cases. In a considerable proportion they are but few in number, and may easily be overlooked. As in adults, they appear in crops from the eighth to the twelfth day onwards. Sudamina are often seen late in the second or third week.*

Bronchitis may be a prominent symptom, and not infrequently is associated with slight hæmoptysis; sometimes it is very severe, and it may prove fatal. I have seen it so severe as to mask the nature of the disease altogether, the case assuming the aspect of acute bronchitis.

Splenic enlargement is present in many cases, and should always be looked for as an aid to diagnosis. Henoch states that he found the spleen palpable in thirty out of seventy-five cases; in others it could be distinguished only by percussion. It appears about the same time as the spots, and is present sometimes in the primary fever, sometimes in the relapse. I have several times watched it increase day by day, and then subside again. One might have supposed that the enlargement would be related to the intensity of the fever; but I cannot say that this has been so in my experience. I have seen considerable enlargement in cases of average severity, and they have done well; but I am inclined to think with Jacobi, that if the spleen remains enlarged a relapse is not unlikely to occur.

The Tongue is often characteristic. It may be coated with a white creamy fur on the dorsum, with red edge and tip, or it may be of a beefy red all over, with prominent papillæ or unnaturally smooth.

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* Dr. H. D. Rolleston tells me of a case—a boy of ten years of age—who peeled from the fingers in small flakes, and from abdomen, thorax, and thigh in large flakes, at the end of the second week of the illness.

The Urine though normal in appearance has been said by Horton-Smith frequently to contain the typhoid bacillus, which has been found by culture, a fact which has a practical bearing on the propagation of the disease, as contagion may be carried by the urine.

After the temperature has fallen to normal, it is not uncommon for the pulse to become abnormally slow, and sometimes irregular. Constipation which may have existed throughout the illness now becomes troublesome in almost every case. The knee jerks at this stage, and indeed during the later part of the febrile stage, are sometimes found to be much exaggerated, and there may be ankle-clonus, a point worth remembering in the diagnosis of typhoid from cerebral conditions. The mental state at this period is sometimes peculiar; we have several times seen mental depression, almost amounting to a mild melancholia, in children at the end of typhoid; one boy about eight years old became quite imbecile for several weeks after the temperature had fallen; another boy, aged ten years, who was under treatment * for a mild attack of typhoid became insane with delusions about a fortnight after the temperature had reached normal. After about a fortnight, during which restraint and isolation were necessary on account of his noisy behaviour, the mental condition began to improve and the boy made a complete recovery.

Duration.—Is much more variable in children than in adults; many cases last only ten or twelve days; seventeen to nineteen days is not by any means an uncommon duration. Then, again, many cases give a preliminary history of three or four weeks of malaise before the onset of any definite symptoms. It is probable, however, that could these be more carefully watched, they would resolve into cases in which a mild primary fever, unrecognised, had led on to a relapse. For instance, a girl, aged seven and a half, had been ill three weeks, had been much worse for seven days, and had suffered from diarrhœa for three days. She was admitted with a steady fever of 104°, diarrhœa, rose spots, and enlargement of the spleen, and the complaint ran a course of fifteen days. The total period was thus divisible into two of fourteen days each. Again, a boy, aged five, said to have been ill three weeks, but worse with diarrhœa three days, was admitted with a temperature of 104°, and the complaint ran a course of nineteen days; a total, again, well divisible into two attacks of between two and three weeks each. Many such cases could be given.

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* *King's College Hosp. Rep.*, vol. viii. p. 369.

Morbid Anatomy.—The ulceration of Peyer's patches and of the solitary glands is less frequent, less extensive, and less characteristic than in adults, and the younger the child the more is this true. In not a few cases no ulceration of any kind has been present; in others one or two small ulcers in parts of the agminated glands; in others slight raised fleshy swelling of the entire patch or parts of it. As in adults, the large intestine may be effected—nay, may even be the chief seat of ulceration; and I have once seen death from the after-results of hæmorrhage from typhoid ulceration of the colon. Perhaps it is in consequence of the mildness of the ulceration that the fever is so variable—that the late or oscillating temperature may sometimes fail—that tympanites and hæmorrhage from the bowels are uncommon—and that death by perforation is one of the rarest modes of termination. Otitis may be present, and in rare cases parotitis; one of my own cases proved fatal in this way. I have only once seen death from acute peritonitis. It was associated with jaundice, ascites, and pleuritic effusion in a child of four and a half years. For the most part, the morbid anatomy of typhoid in children differs from that of adults by wanting all the more characteristic features. Slight ulceration of the solitary glands and of Peyer's patches, or swelling only, combined with a swollen spleen, and more or less sodden solidification of the bases of the lungs, complete the picture in most cases.

The following case may be given as an illustration of these points. It is an exceptional one for two reasons: the early age of the child and the fatal result:

A male child, four years old, attended as an out-patient at the Evelina Hospital with diarrhœa, a tense abdomen, and some rose spots on its buttocks. It was only seen once. It died in convulsions. I made an inspection three days after death.

The spleen was large and rather soft.

The mesenteric glands were large and ecchymosed. Throughout the small intestine Peyer's patches were injected and swollen, so as to be slightly raised above the surrounding level in a flat plaque. The upper patches were mostly ulcerated; one lower down had a circumferential line of ulceration as from a slough just commencing to separate, and others of them had small ulcerated pits in them. The ileo-cæcal valve was ulcerated.

There can be no doubt that this was a case of typhoid fever. There were the large soft spleen, the swollen and ecchymosed glands, and the swollen and ulcerating Peyer's patches; but the swelling of these was very slight as compared with that usually seen in adults.

Diagnosis—Phthisis.—It is a matter of frequent occurrence that a pale, wasted child is brought to the out-patient room with a history of four or five weeks illness, with diarrhœa and cough, the expectoration being slightly streaked with blood. These are signs from which the student not unnaturally concludes that the disease is of phthisical nature. Moreover, this opinion may be apparently confirmed when the chest is examined and he finds bronchitic râles present; or some roughened respiration at the apices which he considers to be bronchial, and therefore to indicate consolidation. A further examination, however, shows that there is no dulness on percussion, and but slight, if any, difference between the abnormal sounds on the two sides; and perhaps the tongue is red and glazed and the abdomen full. After a day or two in bed the case turns out to be typhoid fever in the second or third week. The cases which show marked remissions are equally misleading. See such a case for the first time about four o'clock in the afternoon, and you may perchance find a thin child with bright eye, flushed cheek, high fever, perhaps perspiring profusely, and altogether more like a case of phthisis than of fever to the uninitiated. So often do pictures such as this present themselves in practice, that it is of importance to insist that when in children *primâ facie* phthisis is indicated, the student should have typhoid fever as an associated idea and proceed to decide between the two. Typhoid fever is one of the wasting diseases of childhood.

Acute Tuberculosis.—Sometimes it is quite impossible to decide between this and typhoid fever; the insidious onset is the same for both, and the temperature chart of both is one of oscillations owing to the evening exacerbation of the fever.

Vomiting is sometimes a feature of early typhoid fever, and a slow pulse not by any means infrequent. On the other hand I have several times noticed diarrhœa in acute tuberculosis, and a tuberculous spleen may often be felt below the ribs ; thus it may happen that a positive opinion can only be arrived at after careful observation of all the circumstances of the case at more than one visit, and in some cases—perhaps not very common, but yet sufficiently frequent to necessitate insistence on the fact—the two diseases cannot be distinguished. Widal's test may throw some light upon the diagnosis in this as in other conditions simulating typhoid, but more indisputable evidence is often to be obtained from ophthalmoscopic examination which in acute miliary tuberculosis commonly shows tubercles in the choroid (*vide* chap. xxvii.).

Pneumonia, when the physical signs are latent, may be mistaken for typhoid. The distinguishing points are the hot pungent skin, the flushed face, and rapid, and often grunting respiration, these together with the history of a sudden onset should suggest pneumonia rather than typhoid. Careful examination moreover in such cases will often detect some localised alteration, extremely slight it may be, of percussion note or breath sounds, which will confirm the suspicion of pneumonia.

Meningitis is sometimes extremely difficult to distinguish from typhoid fever. I will illustrate this by two cases :

A boy, aged twelve, came home from school ailing, after the mumps. A boy at the school had had typhoid fever there some months previously, but he was thought to have taken it from elsewhere, the drainage and sanitary conditions being perfect. The lad was pale and thin, with a rather beefy tongue, a full and tense abdomen, and a large spleen ; his evacuations loose but not frequent ; no spots : temp. 101°. For twenty-four days he thus continued, perfectly clear in his intellect but with slight intolerance of light, a frequent short cough, a high but oscillating temperature, and gradually increasing muscular tremor. He also had rather frequent priapism, the import of which did not strike me till afterwards. Gradually a dry pleuritic rub developed, and some evidence of partial consolidation, in diminished resonance and blowing respiration in the scapular region. Next there came pain on movement, delirium at night, and then almost suddenly he passed into a comatose condition, with rigidity of his extremities and more priapism, and he died after an illness of thirty days. For more than three-fourths of that time I was quite unable to decide between typhoid fever and general tuberculosis; but his mode of death, combined with various slight symptoms, the meaning of which could be read more distinctly after—viz., the intolerance of light, the priapism, the muscular tremors, and the pains in his extremities on movement—made the diagnosis without doubt to be cerebro-spinal meningitis.

Another case, a boy, aged five, was admitted with a history of three weeks illness, chiefly of frontal headache, vomiting, and latterly diarrhœa. His temperature was very high (103°–104°), the condition of one lung was questionable, and he had much delirium. For seventeen days he continued in the same condition, without any definite signs of typhoid fever, and with many of severe cerebral disturbance. He had, however, an occasional typhoid-looking stool, and the temperature ran high for tubercular meningitis; therefore, on the whole, I favoured the diagnosis of typhoid, and so it proved to be. From the seventeenth to the twenty-fourth day the temperature fell, and the child got well.

Ulcerative Endocarditis will sometimes closely simulate typhoid fever, and is all the more difficult to distinguish, in that the physical signs of valvular lesion are apt to become masked by the formation of fungating vegetations about the diseased apertures. Any previous history of rheumatism, any evidence of valvular disease, and particularly any evidence that infective maladies of any kind are prevalent, should suggest a careful consideration of this possibility before coming to any definite opinion. **Ostitic Pyæmia** may simulate typhoid fever, and I remember a case of this kind in the Evelina Hospital. A child of about eight was admitted, with diarrhœa, much abdominal distension, and the general aspect of severe typhoid. The result showed a very acute pyæmia, with abscesses in parts of the lung.

Otitis media, specially in the younger children, may closely resemble typhoid, both in its temperature and in its nervous symptoms. The ear should be carefully examined when there is any likelihood that it may be inflamed. We have seen cases where the diagnosis was only settled by the rapid subsidence of symptoms after the discharge of pus from the ear.

Widal's serum diagnosis, which depends upon the action of serum from a typhoid patient on cultures of typhoid bacilli, causing these to lose their motility and to stick together in clumps, is of undoubted value in assisting the diagnosis in difficult cases. A positive result is obtained in most cases of typhoid, but it is not always so; and the reaction has been seen, though less decisively, in cases which proved not to be typhoid. While, therefore, a positive result makes a strong presumption in favour of typhoid, a negative result cannot be considered to exclude it.

Of the **incubation** and other points concerning typhoid fever in general, it is hardly within the scope of the present work to treat; but it may be remarked that, as regards the incubation—which is said to vary from two days to three weeks, and to be most commonly about two weeks—children afford virgin soil, undergo changes of body-heat readily, and therefore may be expected to mature a poison rapidly; an important consideration when tracing the source of infection, or attempting to fix the probable duration of the attack. Further. it would seem that children are peculiarly sensitive to drain emanations, whilst water and milk, which constitute so large a share of their diet, have been shown to be the more common sources of the introduction of the poison.

Treatment.—In the majority of cases the treatment is simple. The child must be kept in bed, its temperature be carefully watched, and the diet regulated. It should be sponged night and morning with warm water, to which a little eau de Cologne or some Sanitas may be added with advantage. The food must be fluid, or pultaceous—such as soaked biscuit, custard, milk, beef-tea, broth or light soup. Should the stomach be inclined to reject these, even lighter materials must be given—milk and lime-water, or milk and water, whey and artificially digested milk, or blancmange. As regards drugs, it is now the fashion to give drugs that act as intestinal antiseptics. β naphthol, liq. sod. chlorinatæ, liq. hydrarg. perchlor., &c., have all been proclaimed as giving good results. I have tried them all and cannot see that they make much difference, but the idea is reasonable enough. A little dilute nitric acid, with syrup, is agreeable and refreshing, and some attach importance to its therapeutic value. Quinine is another remedy much in vogue with some. In cases of moderate duration, no stimulants are necessary; but when the fever extends to, or beyond, the third week, and the symptoms have been severe, two, three, or four ounces of wine, or one or two of brandy, in the twenty-four hours, may be needed after the second week. Constipation is not uncommon, and, if associated with any distension of the abdomen, is to be treated by simple enemata, or a small dose of castor oil. The evacuations should in all cases be treated with some disinfectant, and all soiled linen is to be removed at once and treated in like manner. As regards the more severe cases, the noisy delirium may perhaps indicate the need of stimulants; but the relief thus afforded is not so decided as in adults, and as a rule I do nothing, provided that the child is taking its nourishment well. Small doses of Dover's powder or bromide of potassium are beneficial, and a tepid or warm bath may exercise a calmative and soporific effect. If the temperature is persistently over 103°, frequent resort to tepid sponging, cold sponging, an ice-pack, or the tepid or even cold bath is indicated. An ice-cap to the head is occasionally useful in the same way. Quinine may be given in one, two, or three-grain doses three times a day, and I have also tried salicin, but without much evident effect. Antipyrin may be given to children between six and ten, in doses of three to five grains. It lowers the temperature, sometimes produces profuse sweating, and may possibly be of service occasionally. But it sometimes produces severe depression, and even collapse. Acetanilide is another drug of the same class, and so also is phenacetin. Either is free from any risk and may be given in doses of one to three grains. They are very insoluble and may be given as a powder, which is tasteless, or dissolved in rectified spirit. None of these remedies appear to have any effect in curtailing the duration of the disease; but it is possible that, by keeping the temperature at a lower average level, some good may sometimes result. But this has never been very apparent to me, and I seldom use them now. For abdominal distension there is nothing so good as turpentine (F. 33) or terebene. Either of these may be mixed with mucilage of tragacanth, syrup, and cinnamon-water; or with butter, and put at the back of the tongue; or dropped on sugar. By some such means five drops of the oil of turpentine or two or three of terebene may often be taken without exciting much resistance. Hillier recommends an enema of asafœtida.

For diarrhœa, five drops of tincture of opium with an ounce of starch is the plan of treatment which seems most generally successful; but two or three grains of Dover's powder, given internally once or twice in the twenty-four hours, will often be equally efficacious. A moderate diarrhœa, two or three evacuations in the twenty-four hours, is not to be checked. Severe diarrhœa is generally associated with abdominal distension, and indicates severe ulceration; and although it is the general practice to give opiates, I prefer to combine them with such other drugs as may have some effect upon the surfaces of the ulcers, such as turpentine, borax, &c. It is further advisable in such cases to see to the quantity of food taken. The diarrhœa may be moderated by reducing the quantity of milk, and giving thin broth of chicken, veal, or mutton. Brand's essence of beef gives a large amount of nourishment in a form which one supposes is absorbed from the upper part of the intestines, and cannot leave much behind to worry the ulcerated surface below.

Bismuth subnitrate and ipecacuanha wine are also of use, and so also the tincture of krameria, extract of logwood and chalk mixture. (F. 25.)

For the bronchitis a little ipecacuanha wine (F. 37), with compound tincture of camphor and syrup of tolu, may be given.

In cases of cardiac weakness or renal congestion, caffeine may be found useful; Jacobi thinks more highly of it than of digitalis for heart failure. It may be given in grain doses to children of six or seven years, and may be combined with three or four grains of benzoate of soda; a solution is thus formed which is a powerful diuretic.

As regards treatment by the bath, Henoch makes some very practical remarks. The effects of cold bathing are more pronounced in children than in adults, and consequently the first bath is in some cases an experiment, and it may be followed by a gradually falling temperature, until a condition approaching collapse results. This may be obviated by the administration of wine before and after the bath, but more particularly by trusting to tepid rather than to cold bathing, and by not prolonging the immersion beyond six or eight minutes.

and perhaps œdema or even bullæ of the skin; there is continuous pyrexia—101°-103°—with slight evening remissions, and in favourable cases at the end of a week or ten days the rash ceases and the temperature rapidly falls. Not uncommonly, however, pyæmic complications occur, subcutaneous abscesses form, pyrexia continues, and severe broncho-pneumonia, or acute pleurisy, or suppurative meningitis may prove fatal. The disease, moreover, is rather liable in young infants to assume a migratory character, and wandering thus from part to part is very liable to exhaust the child.

Treatment.—Beyond covering the part with some simple application, such as starch and boric acid powder, or lead lotion, little can be done locally; free stimulation with brandy, or ammonia and ether (F. 2), will probably be needed, and in older children quinine may be useful. In severe cases the administration subcutaneously of antistreptococcus serum is worthy of trial; it may be obtained from the Lister Institute of Preventive Medicine.

Tetanus as an infective disease, might justly find a place here: looking at diseases of children, however, chiefly from the clinical standpoint we shall describe it amongst the diseases of the nervous system (chap. xxxv.).

CHAPTER XXI.

DISEASES OF THE RESPIRATORY SYSTEM.

THE physiological differences between the respiratory organs of the child and of the adult are numerous, and, as regards the examination of children, they are by no means unimportant. The breathing is diaphragmatic in children, and as it is difficult sometimes to detect the movement of the upper part of the thorax, it is very necessary to have the chest sufficiently bare for the purpose of examination. Infants under two years breathe quicker than adults, thirty or more to the minute, but above that age the respirations are at about the same rate as in older people, though quickening at very slight disturbing causes. Children also breathe irregularly; often paroxysmally; after what may be called a modified Cheyne-Stokes type. The Cheyne-Stokes rhythm consists of a series of short but gradually lengthening inspirations culminating in a deep-drawn breath, from which in a descending scale the respiratory movements flutter down to an elongated pause; and this type of respiration, though much modified and its sharper characteristics destroyed, may often be seen in infants. Pauses in respiration are a feature of childhood, and they are particularly marked when the child is crying. To auscultate a chest at such a time requires the greatest patience, the pauses are of such long duration, but the information gained from the succeeding inspiration is peculiarly valuable, each long-drawn breath after the temporary arrest is so full and deep. Infants and children not only breathe irregularly, but often asymmetrically. It is quite a common thing to find a child breathing fully, now with this side, now with that, and unless this is ever present to the examiner he will be not unlikely to make mistakes when it comes to be a question, as so often happens, of the nature of the disease—nay, even of the side upon which it is located. I take this to be due not to the muscular weakness, as some aver, but to the as yet imperfect education which is seen in all the muscles, whether of speech or of voluntary movement. Hence also the Cheyne-Stokes type of respiration, which is a paroxysmal one. Children work paroxysmally, whatever the movement in hand. The nervous discharge takes place, and then comes a pause—another discharge, and another pause—and so on; and it is only as the nervous centres reach a higher state of training that the discharges are so regulated as to become more continuous. I know a little child, and this is not uncommon, who learning to talk will carry on a conversation to the full extent of his knowledge of words, for a few minutes, and then he becomes quite fuddled for a while, and after a rest, on he goes again. The same child, if he is at all out of sorts, will stammer badly; he becomes in fact aphasic intellectually, and his word-memory is for the time exhausted—or his ill-nourished brain loses its discharging force, and acts intermittingly. It is but little otherwise with the respiratory centres, they act irregularly, and soon become exhausted.

A point or two connected with the physical examination of the chest may next be mentioned. Percussion is always to be gentle—apart from the reason that there is the likelihood of frightening the child, heavy percussion may lead to quite an erroneous conclusion. It will often elicit resonance, whereas the note is really dulled. This more readily occurs in dealing with fluid in the chest, and is probably due either to the heavy percussion displacing the fluid and bringing the stroke down upon lung which contains air beneath; or else to the greater readiness with which, in young subjects, the stroke is transmitted to other and sounder parts of the lung. The chest of a child is said to be more sonorous than that of an adult—all that this means is that a more resonant note is more easily elicited; and all that this can mean in turn is, that the percussion acts upon the lung more readily. Probably this is largely due to the more yielding nature of the ribs in young people, and to a thinner covering of soft parts over them.

Due also to this ready yielding of the chest-wall is the facile production of the cracked-pot sound so frequently elicited when percussing the infra-clavicular regions of the chest in healthy children.

Again, it is not difficult to obtain a dull note which is not due to the condition of the lung underneath. A very little difference, for instance, in the level of the two shoulders will effect this, and the irregularity of respiration so noticeable in children will do the same. Therefore, in cases where the differences are slight it is always as well to be cautious in our opinion, and probably to wait until a second examination has confirmed or negatived the original conclusion.

Percussion should be carried out by one finger laid firmly on the chest, and one or two fingers tapping it vertically, slowly, and lightly. With these precautions, a good resonant note ought to be elicited anywhere, although, as in adults, the apices and scapular regions vary much in different children. I see no reason for confining the examination to the back, or for postponing percussion until after auscultation. There is but little difficulty with children, if they are left unrestrained and the percussion is gentle. It is usually well to commence with the examination of the back, so that, if the child is shy, the more important part of the examination may be conducted out of sight; but in a very large number of cases it is perfectly easy even to auscultate the front of the chest if the examiner sets to work with patience, and allows a child to play with the end of the stethoscope at intervals. Nor do I agree that auscultation is better conducted by the ear than by the stethoscope. The chest diseases of children are so apt to be partial in their distribution, and the accommodation of other parts of the lung is apt to be so much more perfect, that it is very necessary to go over the chest carefully inch by inch, to compare the corresponding sides, and to trace the intensity of the respiratory murmur from one side to the other. The ear covers too extensive a surface, and—taking in too much at a time—is thus likely to miss a small patch of consolidation or the deficient expansion which occurs so often. The student will have many a difficulty also with the *quality* of the respiratory murmur. He is usually told that the child's respiration is puerile—that is, that the inspiratory murmur is very harsh; the expiratory being but little altered. But, as a fact, his most frequent difficulty will be to know whether he is dealing with bronchial breathing which is the result of disease, or with that which is due only to a temporary accelerated respiration. In young children the expiratory murmur in the upper two-thirds of the back is frequently of a bronchial nature—longer than it should be, higher pitched than it should be—and the question of the meaning of this can only be settled by close examination of both sides and an appeal to one's experience. The observer should pay special attention to the pitch of the expiratory murmur, this being the best criterion of the nature of the sound. If the murmur be not only *long*, but persistently of high pitch, it is well to be cautious. As another hint, I would say this: If the tubular breathing is of exactly the same quality on both sides, doubt your diagnosis, should you have decided that there is disease. It is so likely under these circumstances to be a tracheal respiration, transmitted, either from exaggeration on its own part, or by too little damping by the vesicular murmur in a small chest. As regards the necessity for careful comparison of the two sides of the chest, pleurisy and pleuritic effusion are very liable to mislead. Pleuritic effusion controls the action of the lung on the diseased side, but hardly otherwise alters the quality of sound, except at the apex, where it often compels tubular breathing; thus it happens that, listening over fluid, the respiration is soft and vesicular, and may seem natural, whilst an examination of the other side discloses what seems to be an excessively harsh and abnormal sound, of doubly peurile character, if so we may express it. Thus, the report is made that the sound side is diseased and the diseased side healthy. This is quite a common mistake, and can only be avoided by paying exclusive attention to no one sign in particular, but by examining both sides of the chest throughout—not only by auscultation, but by percussion also—and by a careful scrutiny of its movements. With these few hints, we may pass to the consideration of special diseases, and there seems no reason for departing from the natural arrangement of working from above downwards.

The Nose.—There are some children who are always "catching cold." This means that they begin to sniffle, and gradually a copious glairy and thin mucous discharge makes its way from the anterior nares. This state may last several days, the upper lip ultimately becoming excoriated and sore from the discharge and its frequent removal combined. During all this time the child is usually fretful, often feverish, thirsty, and without much appetite. Its nights are also disturbed, for young children breathe so much through the nose, that the existing state of things prevents the natural respiration. Stand over the cot of a child with a " cold," and you will hear it sniffling away with quickened respiration, and then suddenly waking up and crying, tossing itself down on to the pillow again, out of temper with its discomfort; and so on repeatedly. These cases run their course, so far as the nose is concerned, in two or three days; but they are frequently succeeded by a cough, due, no doubt, to the extension of the catarrh along the mucous membrane to the posterior nares, tonsils, and fauces, and occasionally down to the epiglottis or rima as well. A cold therefore, if severe, requires care, as at any time it may extend and set up a general bronchitis or even laryngitis.

Causes.—Whether colds are due, as is thought, to chills, or to atmospheric-borne germs, and so on, it would perhaps serve no useful purpose to discuss. But it is of practical import to remember that in many cases they are unquestionably contagious. They are also frequent concomitants of dentition.

Coryza should also be remembered as heralding often the advent of measles, and as being sometimes associated with diphtheria, generally, though not always, with its more fatal forms.

Ozæna.—In unhealthy children, particularly the scrofulous and syphilitic, nasal catarrh is liable to become chronic. The swollen mucous membrane becomes excoriated or deeply ulcerated, and in the most prolonged cases the bone may become exposed and die. In any case there is likely to be ozæna, as the secretion is not merely mucoid, but purulent and bloody. It crusts upon the surface of the mucous membrane, becomes decomposed, and thus the fœtor which is so characteristic and so loathsome. The sense of smell often becomes destroyed in the worst cases, a happy thing for the afflicted child. Chronic nasal catarrh may also be due to a foreign body; to post-nasal growths; to polypus (rarely), or to a deflected septum.

Treatment.—For simple catarrh very little treatment is necessary. Children from a few months old up to three or four years are those that give the most trouble, and perhaps from nine months to two years is the age at which colds are liable to be most severe. The child must be kept in one room at an even temperature, in bed if it is very feverish or fretful, and some saline may be given it, such as the citrate of potash and a little fluid of magnesia to act upon the bowels, if necessary. It is generally as well to give a sleeping draught at night of bromide of potassium and hydrate of chloral; five grains of the one and half a drachm of the syrup of the other may be given to children, if necessary, of two years old and upwards. West remarks that an intractable catarrh is sometimes cured by grey powder, even though there may be no evidence of the syphilitic taint, and my own experience certainly corroborates this. In the chronic cases two ends have to be kept in view, the building up of an unhealthy body, and the cure of the diseased mucous membrane. The local treatment is usually neglected in whole or in part. The parents will make their children take any quantity of medicine, but they will not take the trouble to secure efficient local applications; and, unfortunately, local applications are of the first importance. The chief object of these is to keep the surfaces moist and sweet; the disease is so troublesome, because the discharges crust on the surface and become offensive, and thus in the various movements of the nose the mucous membrane beneath the crusts and at their side cracks and bleeds. Therefore an antiseptic must be applied to keep the parts sweet, and glycerine or oil added to it to keep them supple. A combination of iodoform, eucalyptus oil, and glycerine makes a nice and effective preparation (F. 42), or an ointment in which vaseline is substituted for the glycerine may be used instead. The glycerinum boracis, or glycerine and boric acid, are also useful preparations. But whatever be used, it is essential that it be applied freely and frequently, and this is not easy of accomplishment. Sometimes astringents, such as equal parts of glycerine and the glycerine of tannic acid; or that of sulphate of zinc, in the proportion of two grains to each ounce; or syringing with permanganate of potash, or with warm borax and carbonate of soda lotion (gr. xx ad ℥j), are useful in older children. But the difficulty of local application is greatly enhanced, or becomes an impossibility, in many cases in young children, when the syringe comes to be used. The best way of syringing the nose is undoubtedly the hydraulic method—an india-rubber tube, leading from a small cistern or jug containing the lotion, and placed at the requisite height plays the part of a syphon.

The nose-piece is placed in the nostril, and a most perfect syringing is thus accomplished. But very young children are much frightened by this. The sensation produced by the water in the nose is not pleasant, and some of the fluid runs down into the pharynx and interferes with respiration. Moreover, the operation, to do it properly and cleanly, requires the attention of three people—one to take the child, one to collect the water that flows from the nose, and the third to manage the douche. Therefore this treatment is not often carried out thoroughly, and it is necessary to trust to the application by a brush of the remedies already mentioned. It is more practicable with older children; and with them, in addition to other measures, a plug of iodised or salicylic wool should be kept in each nostril. Failing any of these, some powdered boric acid or benzoin may be blown up each nostril with an insufflator three times a day. The anterior nares and upper lip become excoriated sometimes where there is much discharge; if there is any tendency to soreness, it is well to smear these parts with vaseline or boracic ointment. For general treatment these children require good food, milk, cream, good air—particularly bracing seaside air—and iodide of iron, cod-liver oil, maltine, stout, &c.

The greatest perseverance is necessary in the treatment of ozæna; but, further, it is probable that by the timely treatment of lingering nasal catarrh, the "stitch in time" may avert what will otherwise prove an intractable disease.

Epistaxis is a very common affection in childhood, and under conditions so varied that it is impossible to enumerate them all. Some children suffer again and again, whenever they are out of sorts, and this without any tendency to bleeding elsewhere. It is one of the commonest forms of hæmophilic outbreak, and is also, as might be expected, a symptom of purpura from any cause. It must be remembered also as a symptom, though not a common one, of heart disease. But perhaps it is more noteworthy as most frequently ushering in some acute disorder, be it one of the exanthemata, typhoid fever, pertussis, acute pneumonia, or nephritis.

It but seldom requires treatment save it be the outcome of hæmophilia. Should it do so, the ordinary rules for the arrest of bleeding will at once suggest themselves—viz., ice to the nostrils, cold applications to the face and neck, and an insufflation of tannin or matico snuff, and in addition nowadays one or other of the preparations of suprarenal gland may be used if simpler methods fail: the surface of the mucous membrane may be gently dabbed with a pledget of wool or gauze, soaked in solution of adrenalin chloride diluted with two parts of saline solution (sodium chloride ʒi dissolved in a pint of sterilised water), or if the hæmorrhage is severe the nostrils may be packed with gauze moistened with this solution or with a 1 in 20 solution of the dried extract.

CHAPTER XXII.

LARYNGEAL SPASM—LARYNGITIS—WARTY GROWTH—FOREIGN BODIES IN TRACHEA, &c.

In common parlance there is a tendency amongst mothers to call all the laryngeal diseases of infancy "croup." But they divide themselves readily into two groups: (1) spasmodic; (2) inflammatory.

Spasmodic Affections.—These may be divided into:

(1) *Direct spasm*, or laryngismus stridulus, or crowing of convulsive nature, often rachitic.

(2) *Infantile spasm*, or congenital laryngeal stridor, the crowing due to a congenital valvular formation of the upper orifice of the larynx.

(3) *Reflex spasm*, a spasm of the larynx incited by enlargement of the mediastinal glands.

An objection may be taken to such an arrangement that it exalts a symptom at the expense of the cause, and thus tends to destroy the more stable basis of classification—that of structural change. This has no doubt been felt by other writers, and has led them to treat of such affections of the larynx amongst diseases of the nervous system; but they are so essentially laryngeal that in this relationship lies most of its interest, both as regards theory and practice.

Direct Spasm of the Glottis (Laryngismus Stridulus). I call it direct, because being largely associated with rickets—a complaint which, by the convulsive affections which attend it, indicates a state of instability of brain—it may be regarded, so to speak, as *centrally* ordained.

Some perhaps may still prefer to consider it a reflex spasm. But, if so, the discharging stimulus is so frequently varied that it is impossible to fix upon it with any precision, and in the majority of cases all that can be said is—this is laryngismus, and the child is rickety. Of its convulsive nature, in many cases, there can be no doubt: it is frequently associated with convulsions, and not uncommonly with tetany as well. Its association with facial irritability tells the same tale. Of notes of thirty cases of laryngismus now before me, eight had had convulsions, two others contracture of feet and hands. Dr. Gee notes that nineteen of fifty of his cases had had eclamptic fits. Laryngismus is so frequently associated with rickets that, again appealing to Dr. Gee,* we find him stating that spontaneous laryngismus is always associated with that disease—forty-eight of his fifty cases being unquestionably so. Twenty out of thirty-four of my own cases were also rachitic. The association of **laryngismus** with **craniotabes**—that condition of skull in which the bones yield under pressure with the crackle of parchment—has been remarked upon by several observers, and certainly seems to be very common.

Many have held that dentition is the exciting cause of the laryngeal spasm in these cases, and no doubt the disease occurs about the time the teeth are commencing to make their appearance. All the thirty cases alluded to were under two years of age; and most of them were under a year, from the eighth to the eleventh month being the favourite period. One other point must be alluded to—viz., that the disease is much more prevalent in the first than in the second six months of the year. For this observation we are again indebted to Dr. Gee.† Of sixty-three cases spread over three years, fifty-eight occurred from January to the end of June, and only five from July to December. Dr. Gee very reasonably supposes that inasmuch as teething and gastro-intestinal complaints, which are well-known exciters of convulsions, are prevalent all the year round, the weather must in this instance be at fault. But not directly so. Dr. Gee attributes the disease to a nervous erethism begotten by close confinement to ill-ventilated rooms; and this idea is, I believe, worthy of consideration.

Symptoms.—(1) The classical laryngismus is thus described by West: "The child throws its head back, its face and lips become livid, or an ashy pallor surrounds the mouth, and slight convulsive movements pass over the muscles of the face. The chest is motionless, and suffocation seems impending. But in a few moments the spasm yields, expiration is effected, and the crowing inspiration succeeds." Others depict it in still more alarming terms. But of a disease of this severity I know but little. A large number of infants, most of them nine or ten months old, are brought to the out-patient rooms of hospitals. Some are very rickety; more are but moderately so; and some are not evidently rachitic at all. Sometimes there is a history of convulsions of one kind or another. But the child is usually in moderate or good health; all that is supposed to ail it is, that as soon as there is the least excitement—no matter what the cause—a fit comes on, and there is the transient inability to breathe; this is followed by a long-drawn inspiratory crow, of a similar character to that of pertussis, only, not being preceded by such violent paroxysmal emptying of the chest by cough, it is, of course, less violent, noisy, and prolonged. There may be a wheeze in its character, which, as Dr. West says, is something between the whoop of pertussis and the stridor of true croup.

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* "On Convulsions in Children," *St. Barth. Hosp. Reports*, vol. iii. 1867.

† "On Laryngismus," *St. Barth. Hosp. Reports*, vol. xi. 1875.

The crow over, there is perhaps a fit of crying, and the child returns quickly to its natural playful habit, or else it remains fretful and out of sorts, with a continuance of tetany, until, maybe, there is a general convulsion or the attack slowly passes off.

Prognosis.—Most writers allude to a considerable risk which is supposed by some to attach to laryngismus stridulus; but it is a disease which varies greatly in severity, and taking the whole number of cases into account it is but seldom fatal. Such a spasm, however, being convulsive in nature will necessarily be treacherous, because all convulsions in young children are attended with risk of sudden death, and this has happened often within our own experience.

Treatment.—Laryngismus stridulus, associated as it is with rickets, dentition, and general convulsions, must be watched and treated carefully. If there be any tendency to general convulsions, as indicated by contracture of feet or hands, the bowels should be freely opened by a couple of grains of calomel or syrup of senna, jalapine, cascara sagrada, or what not. The first named is as good as, or perhaps better than, any. After the bowels have well acted, bromide of potassium or sodium, or ammonium, in three to five grain doses, is to be given with some syrup of tolu and dill water, three times a day. The bromide may be combined with fifteen drops to half a drachm of the syrup of chloral, and subsequently, when the immediate tendency to convulsion has passed away, the syrup of the lacto-phosphate of lime and iron, or Parrish's food or steel wine and cod-liver oil, should be given regularly for some time. The greatest attention must be paid to the ventilation of the rooms inhabited by these children. Rachitic laryngismus requires no close confinement to hot and stuffy rooms, but plenty of fresh air, and the body is to be sponged with cold or tepid water regularly every morning.

Infantile Spasm (congenital laryngeal stridor).—There is a class of cases met with in the out-patient room in no inconsiderable number, in which there is laryngismus of a mild type, but so persistent as to make it clear that some local laryngeal fault exists. The condition is generally noticed shortly after birth, and it is remarkable how little it interferes with the child's development or even with its comfort. Such children may show no evidence of rickets—no tendency to convulsions—although, seeing that rickets is a disease so prevalent, it is not to be wondered at that slight evidences of it may exist in some. Two varieties, or perhaps we should say degrees, of this condition are met with. In one group of cases respiration is accompanied under certain circumstances with a curious croaking or clucking sound which is absent at other times. The usual history is, that the child makes a noise as if it were going to choke whenever it is excited, on suddenly awaking from sleep, when it is suddenly taken from a warm to a cold atmosphere, when it cries, sometimes when from sitting up it is placed in bed.

In the other group of cases the croaking sound is practically constant; it may accompany expiration as well as inspiration, and may be present even during deep sleep; but even in the worst cases individual respirations are occasionally quite quiet, and there are variations in the loudness of the croak, which is distinctly aggravated, and to this extent spasmodic under any excitement. This condition seems to be more common in girls than boys.

I have long thought that these cases must result from the conformation of the upper part of the larynx in early infancy. I had supposed that at this time of life the larynx was too yielding, and that when a rush of air was produced by means of deeper or more hurried breathing than usual, it could not pass fast enough. It seems probable, however, from an observation made by Dr. Lees, that it is not so much a yielding of the parts as a natural condition which exists in some cases. Dr. Lees made an inspection of a case which had died from other causes, and he found that the epiglottis was excessively recurved in its vertical axis—as if it had been bent in half down the middle, and that thus the ary-epiglottic folds were brought almost into opposition, and a mere chink left between them. A somewhat similar appearance, with the addition of a valvular action of the flaccid arytæno-epiglottidean folds, has been described by Drs. Sutherland and Lack, who, however, deny the existence of any spasmodic element. Dr. John Thomson, on the other hand, regards the condition as entirely spasmodic, and due to a defective co-ordination of respiratory muscles. Now, more or less recurving of the epiglottis is a common thing in infancy and early childhood, and we can quite believe that some such condition, combined with some degree of spasm, may explain some of the cases of laryngismus which would otherwise be swept into the net of convulsive laryngismus, on account of the co-existence of a very moderate rachitis. The history of so many of these cases is that they breathe quite naturally until they begin to breathe hurriedly; but as soon as this happens, no matter what the cause, then there is dyspnœa and crowing. These cases are very little, if at all, relieved by treatment, and the symptom gradually passes off as the child grows older, probably in most cases about the end of the second year.

Diagnosis.—The spasm due to an infantile conformation may not be easy to distinguish clinically. The history of its occurrence from birth is the most important point, and in addition to this, the cause being persistent, the dyspnœa will be more or less continuous, and slight inspiratory crowing will often occur two or three times during one inspiration. The inspirations may be of a more reedy or croaking character, and the crow is less associated with rickets, less of a convulsive affection, the child can hardly be said to be much, if at all, distressed by it, and it is less amenable to treatment.

Prognosis.—To that form of spasm which is due to infantile narrowing of the glottic aperture, hardly any danger attaches, but in weakly children it may possibly lead to some distortion of the chest, and has in rare instances proved fatal. As a rule it passes off about the end of the second year although it sometimes returns at times of excitement or of ill-health.

Treatment.—Little can be done save, perhaps, to give tonic medicines, and await the growth of the child, and the fuller development of the larynx.

Reflex Spasm, due to excitement or worry of the mediastinal branches of the vagus, is without doubt a real occurrence; but it has, to some extent, got into bad odour from the fact that some authors have endeavoured to make all laryngeal spasm, apart from actual laryngitis, due to this cause. Thus, we have the spasm of pertussis due to bronchial gland enlargement, thymic asthma from engorgement of the thymus, and other conditions due to other forms of mediastinal trouble. This view does not appear to me to be tenable. Mediastinal affections have their sphere in the provocation of laryngeal spasm, but not to the exclusion of other forms. I have seen laryngeal spasm associated with cheesy bronchial glands, with cheesy bronchial glands softening, with suppuration in the mediastinum, with fleshy swelling of the mediastinal glands from acute inflammation, and even, as I supposed, with a swollen condition of the thymus. Something of the same kind, too, occasionally occurs in the course of acute pericarditis and pleurisy. It is no argument against the potency of these conditions that they are not always, or even mostly, effective in producing the spasm. All convulsive affections are so largely due to individual proclivity, to disorderly nerve discharge, that no doubt a personal element is requisite as well as the local condition; but, that the local condition is sometimes associated with laryngeal spasm, which is distinguished by symptoms which allow of a correct diagnosis, there can, I think, be no doubt.

Symptoms.—Reflex spasm is sometimes, one hardly dare say generally, associated with more or less persistent wheezing, as if from general bronchitis. Thus, such cases are liable to be mistaken for spasmodic asthma. Asthma may occur, and very severely, in children; but the possible existence of some enlargement of the bronchial glands should always be in mind in such cases. Cough is another symptom of great value; there may be a persistent laryngeal tone about it which is peculiar, and it may be paroxysmal, and so make the parent think the child must have whooping-cough. The likeness is pertussis to sometimes further increased by the occurrence of vomiting after the cough. Hoarseness is sometimes present. These features should be remembered after severe and prolonged attacks of pertussis, and the attention turned to the possibility of the existence of some bronchial gland enlargement.

Treatment.—In the reflex spasm all such things as will tend to reduce enlargement of glands must be adopted: these are a prolonged sojourn at the seaside; the inhalation of iodine or chloride of ammonium; the internal administration of chloride of calcium in doses of four or five grains three times a day; of hypophosphite of soda in ten to twenty grains doses (Sturges); of arsenic; iodide of iron, and cod-liver oil; and possibly some local applications applied between the scapulæ over the fourth and fifth dorsal vertebræ.

Inflammatory Affections.—These may be classified thus:

Catarrhal Spasm, or Laryngitis Stridulosa.
Laryngitis, Acute { Simple. / Membranous.
Chronic (usually syphilitic).

Catarrhal Spasm (Laryngitis Stridulosa, Pseudo-Croup).—"My child is very subject to croup," is a common tale of mothers to the doctor; and as when a patient states that he or she has had a weak heart for years, the medical man knows it to be the exception to find any organic disease, so here, the croup of domestic medicine is not generally the croup of the nomenclature of disease. Here, *e.g.*, is such a case:

A boy, aged five and a half. He had a croupy cough three months ago, but got well in a day or two with castor oil. He had been quite well since, until the day before he came to the hospital, when the cough had returned. He had a loud brassy cough but no dyspnœa, and seemed otherwise quite well. The fauces were injected and the tonsils large. Some castor oil and a simple expectorant were administered, and he was well in a day or two. The mother had already lost one child by true croup—tracheotomy having been performed in the hospital—and she was therefore very anxious about the symptoms in this case.

Henoch gives one of the best and most natural accounts of this affection with which I am acquainted. These children have usually been the subjects of repeated attacks of sub-acute tonsillitis, and they have enlarged tonsils. This condition of parts is usually accompanied by a more or less fleshy or swollen state of the palate and mucous membrane around the laryngeal orifice, and, as a result of some fresh but often slight catarrh, the ary-epiglottic folds become implicated, and some slight glottic spasm occurs. The child has usually had a slight "cold," perhaps wakes up suddenly at night with an ugly laryngeal "brassy," "clanging," "croupy," cough, and perhaps, with some temporary difficulty of breathing. This soon subsides, and it lies down to sleep again, breathing without discomfort, as soon as the fright of the awaking has passed off. This shows that the essential of the laryngeal trouble is spasm. The cough remains "croupy," for a day or two, and then passes off.

The following case may serve to illustrate the condition in its most typical form, and to emphasise the difficulty of diagnosis:

Mary S., aged seven years, went to bed perfectly well one night at 7 P.M. At 12 midnight the mother, hearing an extraordinary noise, entered the bedroom and found the child, who had left her bed, standing up and breathing with great difficulty; making a noise which the mother described as being "like some animal in the room." The child was seen by a doctor half an hour later, and was thought to be suffering from laryngeal diphtheria and to require immediate tracheotomy. It was sent to the Hospital for Sick Children, where it was seen one hour after the beginning of the attack. The child did not look ill, but there was loud and constant inspiratory stridor, with recession of the lower intercostal spaces. The voice was not definitely hoarse; there was no coryza, and the throat was normal. Temperature 99·2°. The most important point in the diagnosis here was evidently the remarkably sudden onset, and this together with the absence of evidence of diphtheria or oncoming measles, seemed to point to catarrhal spasm. The child was accordingly admitted to a general ward under the care of Dr. Penrose; calomel was given internally, and turpentine stupes applied over the upper part of the sternum. Within half an hour the stridor had almost gone, and four or five hours after admission the child was perfectly well.

Diagnosis.—This is arrived at by giving attention to the following features: The tendency to recurrence which these attacks evince; the pre-existence of a cold or cough; the presence of large tonsils. In the attack itself there is the sudden onset, often at night, the unchanged cry, the absence of constitutional disturbance, and the short duration of the respiratory difficulty. All these things tell of the absence of any material obstruction, and in favour of a temporary laryngeal spasm, provoked by some catarrhal state of the upper laryngeal orifice. At the same time, as a word of caution, it may be remarked that it is only natural to suppose that a condition of this kind, if neglected, might readily pass on into an attack of definite laryngitis; and, no doubt, care is requisite lest, in treating such an attack as of no moment, we should find that an exceptional case proves in the issue to be one of true croup.

Prognosis.—Catarrhal spasm or laryngitis stridulosa is induced by a mild form of inflammation or catarrh, but it is so largely neurotic, and as such subsides so quickly, that it involves no danger to life. It is in fact a disease which in its incidence and progress closely resembles asthma, for whilst each is associated with more or less catarrh each is essentially a paroxysmal neurosis.

Treatment.—The croupy cough is one that invariably causes anxiety to the mother, and there is therefore but little risk of such cases being neglected. But the treatment should be decided, nevertheless. The child must be kept to its bed until the cough has assumed a less menacing sound, and the room must be kept warm by a fire and the air moist by means of a bronchitis kettle. Poultices or warm fomentations are to be applied to the throat, and some expectorant is to be given frequently. Tr. benzoin. co., ♏x; syrup. scillæ, ʒss; ext. glycyrrh. liq. ʒss; aq. ad ʒij, may be given, or some similar combination of expectorants. Subsequently, the treatment of the tonsillar enlargement becomes again prominent, but this is discussed in its proper place.

I have called this condition catarrhal spasm rather than pseudo-croup or laryngitis stridulosa, not for the purpose of inventing a new name, but because it suggests the nature of the chief features of the disease, and because it is in harmony with the other spasmodic affections of the larynx which occur in childhood, between which and the purely inflammatory conditions next to be described, it forms indeed an intermediary.

Acute Simple Laryngitis.—Acute non-membranous laryngitis is by no means uncommon. It occurs with, or after measles, whooping-cough, pneumonia, scarlatina, and diphtheria; and also, amongst the lower classes at any rate, without any known cause, and it must be supposed, therefore, from simple exposure. I have notes of nineteen such cases, seven of which, being urgently ill, were admitted to the hospital. They all got well without exception—most of them with the simple treatment of a steam tent. On looking over the admission book at the Evelina Hospital, from 1874 to 1880, I find that about forty-five cases of laryngitis were admitted, twelve being called croup or diphtheria. To these I have added my own cases. The age which is most liable to the disease comes out with remarkable precision as from one to four years:

Under . .	1	2	3	4	5	6	7	8	9	10
	0	14	10	17	5	1	4	3	0	3

Of a series of sixty-one cases, thirty-six were girls, twenty-five boys.

The following case is a fairly typical one:

A girl, aged four years, had measles three weeks before she came to the hospital. Her cough had continued ever since, but she was not noticed to breathe badly until four days previously. The breathing had since then rapidly become more difficult. The child was livid-looking, with a noisy inspiration and expiration, and at the least disturbance the dyspnœa and the retraction of the thoracic walls were considerable. The tongue was furred: the temp. 101·5°; the pulse very quick and irregular; no lymph could be seen on the fauces. She was admitted under Dr. Baxter, placed in a tent, the atmosphere well steamed, and she quickly improved.

Many similar cases could be given.

In the one or two cases that I have been able to examine laryngoscopically, the epiglottis has been, perhaps, a little swollen, and the ary-epiglottic folds also, but the visible changes were not great. There is some difference of opinion as to the feasibility of using the laryngoscope in children. I doubt whether laryngoscopy can be often available before the age of eight or ten years.

Diagnosis.—This seems to me to be very aptly expressed by the old proverb, "the proof of the pudding is in the eating."

A child comes with symptoms such as I have narrated, and it is generally impossible to say offhand whether it has membranous or simple laryngitis. If no membrane can be seen on the fauces, and there is no local inflammation, no enlargement or induration of the glands of the neck, but little fever, and no albumin in the urine, a fair hope may be indulged that the laryngitis is simple. No more can be said at first; the case must be allowed to unfold itself. But to show how impossible is a diagnosis sometimes, the student may be reminded that many a case thought to be membranous has speedily recovered under a treatment of simple warmth and moisture; that many another case, perhaps made light of at its commencement, has slowly matured into a fatal membranous laryngitis.

Prognosis.—All cases of laryngeal obstruction require a cautious forecast for reasons just given, but no reliable opinion can be formed until the patient has been seen in bed, and after some hours of restriction to a regulated atmosphere of warmth and moisture. All such cases are naturally attended with risk so long as the breathing remains stridulous. But this dread symptom will often quickly subside when the child is placed in a tent and the air saturated with steam from the bronchitis-kettle.

Treatment.—Of the first importance is a small tent not far from the fire, and from which a steam-kettle can be directed towards the patient. The child must not, however, be kept too hot—a temperature of 65° is not to be exceeded. Somewhere between this and 60° will be proper. In warm weather, all that will be necessary will be a tent and the steam produced by means of a spirit-lamp placed under the kettle by the side or at the foot of the cot. It is a good plan to medicate the vapour by some compound tincture of benzoin; and, when there are suspicions of membranous inflammation, the mixture of creosote and carbolic acid, or of terebene, recommended at page 246, is good.

If the case is a severe one, it is well to give an emetic, and the simple powdered ipecacuanha root is at once harmless and effective, five grains being usually sufficient; a teaspoonful of the wine may be given if it be preferred, and the dose is to be repeated if not successful within fifteen or twenty minutes. Considerable relief to the breathing is often procured by this means; and, by a judicious repetition of the emetic as the breathing becomes embarrassed, the pressing symptoms are shortly quite relieved or kept at bay. In the meantime, however, it is well to give small doses of antimonial wine, five minims every two or three hours, and to act upon the bowels with a little hyd. c. cret. or calomel. In very severe cases, many recommend that four or six leeches be applied to the top of the sternum, and that a blister should be applied to the throat. I cannot regard either remedy with much favour. Emetics seem to me to be less dangerous and more reliable. Ice-cold compresses may be applied to the throat, and should all these means fail and there be a risk of suffocation—as happens in the worst cases—intubation or tracheotomy must be performed. Upon this head, however, it is worth saying that the student is often too urgent as regards operation. A child breathing stridulously no doubt requires most careful watching, but does not necessarily require an immediate operation. The larger number of cases of laryngitis, even with symptoms of some severity, are amenable to medical treatment, and therefore delay is always advisable until it be seen what effect the remedies may have upon the disease. Everything should be ready to hand in case of emergency. Should tracheotomy be resorted to, let me repeat that success will, in a large measure, depend upon the strict practice of the principles already advocated under the head of Diphtheria.

Acute Membranous Laryngitis (Croup) will not need much consideration here, as it would be only to repeat what I have said under the head Diphtheria. There are many who hold that all membranous laryngitis is diphtheritic; others, who are equally dogmatic, that it is sometimes so, and sometimes due to simple inflammation. And in this regard it is no doubt to some extent apposite that scalds of the throat, which are not very uncommon, seem liable to produce a membranous form of inflammation. But there are objections to cases of this kind, because the local irritant acts by producing physical changes in the mucous membrane, sometimes even to the boiling of the surface and the detachment of a slough. But there are extreme difficulties surrounding the subject on all hands. The diphtheritic poison is one which appears to originate under a variety of circumstances, the absence of which in their entirety it is seldom possible to prove; there are many cases of croup in which the existence of membrane is uncertain, yet they make part of the case in favour of an inflammatory membranous disease when it is quite possible all the time that they may be simple non-membranous laryngitis. There is equally no doubt that many cases at first called croup have proved to be diphtheritic by the fact that they have carried contagion; and diphtheritic membrane may unquestionably be confined to the larynx. Thus it would appear that the only grounds upon which a distinction can be really maintained are the proofs afforded by the cultivation of the bacillus* and the clinical symptoms. The first of these is now within our reach for many cases; but when it is not, there is still, as regards symptoms, an essential difference which I do not feel disposed to yield. If in a long course of years a large number of most experienced men say that membranous laryngitis is sometimes attended with high inflammatory fever—at others with low fever, requiring the brisk administration of the strongest nutriment at frequent intervals and plenty of stimulant, I think we should be careful how we neglect such statements. Many different conditions will produce a pneumonia, yet the pathological changes will be indistinguishable in one and the other. And so with membranous laryngitis. A similarity of local change is no conclusive argument in favour of a common cause, and I say if it can be established that at the bedside there are two groups of cases, the one with one set of symptoms and requiring antiphlogistic remedies, the other with another set and requiring other treatment of an opposite tendency, I for one should be inclined to trust to the symptoms as the best indication of the reality of the difference. The only doubt I have is whether in *laryngeal* diphtheria the symptoms are, as is maintained, markedly those of an asthenic or prostrating disease, as they certainly are in most cases of the tonsillar variety.

Chronic Laryngitis is more often of syphilitic origin than not—sometimes it is a remnant of former membranous laryngitis. Various degrees are met with, from simple hoarseness to considerable inspiratory stridor.

A child—an infant eight or nine months old—was recently under my care who had had snuffles, rash, and ulcerating condylomata of the anus, and who was completely aphonic; it cried with a hoarse whisper, and had at one time some dyspnœa. This subsided under mercurial treatment, but the loss of voice remained, and no doubt there was considerable laryngeal disease. Hoarseness, however, does not necessarily mean gross structural change in the larynx in these cases. In a syphilitic infant who had been persistently hoarse, we found post mortem no naked eye change in the larynx. Another case—a girl of four—I watched for a long time; she was hoarse and breathed badly, and had a sunken nose. She gradually got worse, and tracheotomy became necessary. She also improved under mercurials and iodide, but the hoarseness still continued, when she was ultimately lost sight of. I could give notes of several other cases which have been improved or cured by mercurials or iodide either in the hospital or as out-patients. I must, however, mention two exceptional cases.

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* See pages 224, 236.

A male infant, aged four months, was admitted to the Evelina Hospital, and I saw it soon after its admission. It was one of six children. The mother had had three miscarriages. The child had had a sore mouth and snuffles for a month. It was pale and emaciated, with purulent ozæna, snuffles, ulceration of the tongue and mouth, and it had a hissing aphonia with stridulous dyspnœa. Clean-punched deep sores were present about the anus and scrotum, and there were large brown discolorations in various places. The dyspnœa was very great, but the child was so emaciated and so young, that no chance was offered of relief by opening the trachea, and it was therefore treated by mercurials alone. It died a short time after its admission, and at the autopsy a large vertical ulcer was found in the larynx at the base of the epiglottis and perforating the thyro-hyoid membrane.

The second case, a girl of four, was brought as an out-patient for noisy breathing, which had been getting worse for three months. She was a healthy-looking child, but breathed with a constant slight stridor which increased when she coughed or exerted herself. Her voice was but little altered, its pitch being slightly raised without loss of tone. There was a distinct elastic fulness of a peculiarly soft character over the thyroid body, but no distinct enlargement of that body itself. The carotids were displaced outwards, and there was bulging of the posterior wall of the pharynx. She was under my care for about three months, and Mr. Clement Lucas, who saw her with me, inclined to the view that retro-pharyngeal abscess existed with an enlarged thyroid. She was subsequently admitted under Dr. Taylor, and her breathing becoming worse, tracheotomy was performed, and she died not long after. The autopsy showed a large fatty tumour extending from the base of the skull down behind the pharynx.*

With this case in view, it may also be mentioned that an enlarged thyroid sometimes causes dyspnœa from pressing on the trachea, and that occasionally also the pressure of enlarged and caseous glands may do the same.

Diagnosis.—This must be attempted rather by bearing in mind what are the possibilities, and by excluding those affections which in the particular case are contra-indicated. The symptoms of chronic laryngitis may be produced by syphilitic inflammation of the larynx, by warty growths in the larynx, by chronic thickening resulting from a bygone croup, or by extension of disease from the mucous membrane around. It may also be simulated by disease outside, such as a retro-pharyngeal abscess or a new growth of any kind. But in this class of cases there is usually marked dysphagia, and there are likely to be peculiarities in the case, suggesting that it is not a straightforward one of laryngitis. As regards pressure upon the trachea to which I have alluded, Gerhardt has stated that immobility of the vocal cords during the respiratory act is its symptom; this might possibly be of use when a laryngoscopical examination can be made.

Prognosis.—This will, of course, depend upon the origin of the disease. So far as the dyspnœa is concerned, these cases do remarkably well. But one must be rather cautious in expressing an opinion as to the return of the voice, as the aphonia appears to be a less remediable condition.

Treatment.—If the dyspnœa is at all urgent, and probably in any case, it will be advisable to try what a moist atmosphere will do, and either iodide or a mercurial should be given internally. In very chronic cases, where the dyspnœa is considerable and intractable, it may be well to consider tracheotomy as a *remedial* measure. It certainly would seem that the continued action of a larynx, reduced to a mere chink, although sufficient perhaps for the purposes of aeration—not without discomfort—

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* This case has been published by Dr. Taylor in the *Trans. Path. Soc.* vol. xxviii.

tends to perpetuate its own ill by keeping up spasm and augmenting the products of inflammation. Tracheotomy puts the parts at rest, and therefore favours their return to a healthy state. Moreover, although at no time would I counsel a resort to laryngotomy or tracheotomy until all other means of relief have been discussed or exhausted, yet treated *secundum artem*, I believe that the operation is less dangerous in such cases than those in which it is performed for diphtheria, croup, or acute inflammation about the respiratory passages. Of other conditions than these which cause laryngeal dyspnœa, warty growths in the larynx and retro-pharyngeal abscess are perhaps the more important; but œdema glottidis may be occasionally met with, though I think but rarely, from the extension of inflammation from the tonsils or the mucous membrane of the nose and pharynx. Perhaps more common than any is a certain amount of obstruction to the respiration from a general thickening and hypertrophy of the pharyngeal mucous membrane—a state of things which must always be borne in mind. The mucous membrane under these circumstances is spongy and warty-looking—sometimes thrown into rugæ, and altogether considerably narrowing the faucial passage. I have several times been puzzled in such cases to know whether I was dealing with this disease or with some retro-pharyngeal abscess—the complete examination of the throat in young children being a matter of so much difficulty. The pharyngeal conditions are described more in detail in their appropriate place, p. 173.

Warty Growths in the larynx are rare, and their diagnosis very difficult; in one case, a child of about two was examined by the most expert of laryngoscopists, and after tracheotomy, but no diagnosis was arrived at. In another, an older child of four, the growths were seen in the larynx by the laryngeal mirror only after tracheotomy had been performed. Long-standing hoarseness and difficulty of breathing unassociated with fever, and when syphilis or phthisis can be excluded, are very probably due to a new growth; to say this is to give a very concise and practical summary of almost all our means of diagnosis. Laryngeal warts always have a well-marked cauliflower-like aspect; they are true warts or papillomata, and they grow from the surface of the true vocal cords, or from other parts of the larynx, usually below them.

Treatment.—This must necessarily be a difficult matter. If the growths can be attacked from the mouth, they may be swabbed with chromic acid solution, or still better perhaps, painted with some salicylic cream or salicylic acid in glycerine; and occasionally it is possible to remove them from above by operation. Two or three such cases are on record in children of such tender age as from three to five years. But in most cases the persistence of symptoms of chronic laryngitis ultimately leads to tracheotomy, and it is only after the operation that the throat becomes tolerant enough to enable anything to be done by the mouth. Possibly the warts may then be removed by this channel; they are easily detached if they can be reached. In several cases now on record, however, the continuance of dyspnœa has necessitated the operation called "thyrotomy": the thyroid cartilage is slit up in the middle, the larynx opened, and the warts removed, some solution such as I have named being applied to the diseased surface afterwards, and the parts again carefully adjusted and secured by sutures. This was done three or four times in a case under the care of my colleague, Mr. Davies-Colley, and with ultimate success, and the boy was still well eight years later, but he could only talk in a hoarse whisper.*

The operation of tracheotomy for these growths has been performed, according to Gerhardt, fourteen times—six successfully, at the ages of fifteen, eleven, six, six, five and a half, and three and a half years; the remainder unsuccessfully, at the ages of eight, three, two and a half, two and one-third, and two; and from these data the conclusion is drawn, which is probably a sound one, that the younger the child the greater the risk from operation. Thyrotomy has been performed in twenty-one cases, but the results do not appear to have been very successful, if we take into account that some patients died, and that in many the growths recurred, necessitating in some cases a repetition of the operation. Nevertheless, it must be performed when other means have failed.

Foreign Bodies in the trachea, if not expelled by coughing, will require surgical treatment, and probably tracheotomy. They produce more or less general bronchitis and paroxysmal attacks of urgent dyspnœa. The history of these paroxysms is, no doubt, that the body, usually a pea or something round, is drawn into the trachea and plugs the bronchus. There it remains for a time until the mucous secretion set up by its presence induces a more than usually violent fit of coughing. This dislodges the body and drives it into the upper part of the trachea, perhaps into the larynx below the cords, where the irritation provokes spasm. By-and-by the body falls down again into its former spot and the spasm subsides, to be again renewed until expulsion of the body is procured or broncho-pneumonia is set up by the worry of its presence. It may happen that the body, instead of falling down into its former position, passes up beyond the bifurcation and falls down into the other bronchus; we have known this happen, and by the sudden change in the physical signs greatly assist the diagnosis. But there is a further point upon which we would insist—viz., that if the foreign body becomes fixed in the bronchus, paroxysmal dyspnœa will probably be absent, and even when the foreign body first enters the trachea, coughing may be so slight that no suspicion is aroused of its cause, and the child resumes its play as if nothing had happened. It is not uncommon for fish-bones and other bodies to stick in one or other bronchus—usually the right—and there to set up a unilateral bronchitis, the cause of which may be puzzling and overlooked unless this possibility be borne in mind. Numerous cases are on record of pieces of bone, wheat-ears, &c., becoming impacted in the bronchus, and thus setting up a fatal pneumonia. Sir Samuel Wilks has published a case in which an ear of grass worked its way down the bronchus to the surface of the lung, there set up an empyema, and was discharged by the opening made for the evacuation of the pus.

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* This patient has reappeared as a young man under my colleague, Mr. Symonds, at Guy's, with fresh warts in the larynx.

Treatment.—Foreign bodies may be expelled by coughing, or by emesis. Their expulsion has sometimes been apparently favoured by holding the patient heels up and head downwards; but tracheotomy is often necessary, and the prognosis in such cases is not favourable unless the body is quickly expelled. Mr. Durham successfully performed thyrotomy in one case, a cherry-stone being impacted in the larynx, and other cases are now on record, notably one by Sir Thomas Smith, of St. Bartholomew's Hospital, where foreign bodies have been extracted from the bronchus. In a boy aged ten years who was thought to have "swallowed" a hobnail three weeks previously, Mr. Burghard was able to localise the hobnail in the left bronchus, and to grip it and withdraw it successfully through an incision in the trachea; in this case the X-rays and fluorescent screen which were used during the operation to guide the forceps, contributed greatly to the success of the operation.

CHAPTER XXIII.

BRONCHITIS AND BRONCHIECTASIS—ATELECTASIS—ASTHMA.

Bronchitis is one of the commonest affections of childhood. It is most common as a disease of the large and medium-sized tubes, but is very apt to spread from these to the smaller tubes, and to lead to broncho-pneumonia and to atelectasis. It is in respect of these diseases that its importance chiefly lies. It is usually ascribed to the effects of chill, but without denying this in any way, I believe its cause to be far more often intrinsic than extrinsic, if I may so speak. There are many children who have an acute bronchitis, mostly of the larger tubes, when teeth are just coming through the gums; there are others, usually older children, whose irregularities in diet and in the gastro-intestinal secretions are revealed in the same way. The ascaris lumbricoides may provoke similar disturbances, and the symptoms possibly subside on the expulsion of the worm. Such cases are probably of neurotic origin, and are examples of reflex nervous disturbance, the worry at one end of a nerve being transmitted to some other of the lines in communication with it. Then there are the specific poisons, such as that of measles, of pertussis, or of typhoid fever; there are local peculiarities of action in the muscle of the bronchial tubes; there are all the conditions of catarrh in the upper passages; there are the series of tubercular conditions, which, in any given case, must all be taken into consideration; and last, but not least, there are the chronic conditions dependent upon atelectasis, which are ever ready to favour the onset of an acute catarrh. No doubt, beside all these, there are many other causes of which we know even less; exposure of the skin to chills will interfere with its action, will disturb the balance of the circulation and tend to throw undue stress upon all the viscera, the lungs amongst them. Atmospheric disturbances, electrical and other, and abnormal constituents of the particulate dust, must also be of importance ; but it is of very little use discussing these things at length, for at best it could be but as the blind man offering to lead his fellow. In dealing with bronchitis, however, and all such things as are supposed to be determined by *chill*, I would have the student interpret this in the widest sense, and think out carefully for himself how much or how little it may mean.

Symptoms.—Acute bronchitis, as it is seen in any of these cases, is a pretty definite disease. Its onset is usually sudden, attended with high fever (102° or 103°), rapid laboured respiration, dilating alæ nasi, and usually a good deal of perspiration. The tongue is thickly furred. There is a frequent, short, dry, and subsequently moist, cough. On examining such a case, the chest will be rising very rapidly, the sternum plunging forwards, probably the lower ribs at the same time becoming retracted inwards, and the diaphragm moving forcibly downwards, so as to round the abdomen into a ball-like shape at the end of inspiration. The more the impediment to the entrance of air into the lungs, the more will these features be noticed, and the severity of the case may in great measure therefore be judged in this way. In the worst cases the features are livid and the child very restless. On percussion, nothing will be made out with certainty, and on auscultation there will be bubbling and squeaking all over the chest. At the apices the inspiration will be harsh and the expiratory murmur long and snoring, while the sounds at the bases are moister, and will be transmitted more strongly to the ear, should the disease be associated with broncho-pneumonia.

As a rule, there is no expectoration, and the cough need not be a prominent feature. Sometimes it is frequent and distressing, and occasionally it comes on in paroxysms, and is attended with the passage into the mouth of muco-purulent material, not unlike that in pertussis, which should be removed by a pocket-handkerchief. At other times, although the respiration is very rapid, the cough indicates by its harshness that the upper parts of the air-passages are mostly affected.

The disease is one of variable duration—seven or eight days may be given as perhaps an average. It is usually accompanied by anorexia and thirst, whilst the urine is stated by Meigs and Pepper to be frequently temporarily albuminous.

But a large number of children who apply for treatment in the out-patient rooms of hospitals have a much milder attack than this. They are out of sorts, often rickety, and have cough with some slight pyrexia, and on auscultation some coarse and fine râles are heard in various parts of the chest.

An equally important group of cases is associated with a persistent dilatation of the tubes and atelectasis. In these cases, again, the respiration is very rapid, shallow, and often laboured; the child is restless, blue, and bathed in perspiration, and there is a frequent short moist cough. The temperature generally rises to 102° or so. The tongue is thickly furred. The auscultatory signs are much like those in the former case, but supervening as the disease does upon collapse and bronchitis, there may be very little air entering the bases of the lungs, more or less dulness, and even signs of considerable consolidation.

Diagnosis.—Two difficulties may be noticed—one as regards the general symptoms. There are many children during the period of the first dentition who suffer from an acute febrile condition of a sudden onset, and in whom the respiration quickens up in proportion to the fever. It is not difficult to mistake the appearances in such a case for those of bronchitis, but the auscultatory phenomena are not those of bronchitis, and after two or three days—perhaps before, perhaps on the eruption of a tooth, or on the administration of some aperient or diaphoretic—down drops the temperature as suddenly as it rose, and the child is practically well.

A more serious difficulty is to determine whether there is any actual **consolidation** of the lung. Very careful auscultation will be required to determine this point, and a consideration of the character of the mucous râles that are to be heard. When, too, the acute disease supervenes upon a chronic condition, the amount of dulness towards the bases from the pre-existing collapse makes the question a difficult one to decide. Bronchitis, collapse, and broncho-pneumonia are, however, so frequently associated that in one sense the importance of the question is minimised, and it is often decided rather upon the general symptoms than by the physical signs, which may be hard to gauge with accuracy; in another sense it is of the more importance, determining, as the existence of pneumonia often will, a fatal issue. Carmichael remarks, and I think truly, on the diagnostic value of the temperature in these cases, that the record of acute bronchitis is usually pretty regular, whereas that of broncho-pneumonia is often markedly remittent.* Under special circumstances also, the diagnosis becomes difficult. For instance, at the termination of whooping-cough, the wasted condition of the child, and the excess of pulmonary impediment, may easily simulate phthisis. I have before alluded to the bronchitis of typhoid fever being occasionally so severe as to mask the essential disease.

Prognosis.—This must depend upon the general symptoms rather than upon the physical signs. Where the respiration is very rapid and laboured, the dyspnœa increasing, the child blue and exhausted, though restless, cool and clammy, somnolent, and taking food badly, the prognosis must be grave. If, too, there be much inspiratory retraction of the sides of the chest, or the sharp râles of broncho-pneumonia in addition, or if the child be very drowsy, or the Cheyne-Stokes type of respiration becomes at all pronounced, there is of necessity an added risk. All the same, the opinion should be a cautious one; for, with careful treatment, the worst-looking cases may slowly pull round.

Treatment.—The child is placed in bed, and in a tent, with a steam-kettle in the neighbourhood to moisten the air. A little carbolic acid may be put into the vapour—one in eighty will be sufficient. Do not do too much in this way. I often see this treatment, as I think, terribly overdone, and the child might as well be in a laundry or a thick Scotch mist. If there be much fever, I apply an ice poultice, an ice bag, a cold compress, sometimes a warm fomentation to the chest; otherwise a light jacket of cotton-wool or Gamgee tissue should be made to envelop the chest. Many think highly of a mustard counter-irritant. But let this be done carefully; the skin of a child very readily blisters, and a large blister is no unimportant cause of nervous shock. A safer counter-irritant is perhaps a turpentine stupe. This may be applied over the front and the back of the chest alternately every three hours. The skin should be smeared with vaseline first, and a piece of lint wrung out of cold turpentine should then be applied. An infant one or two years old will usually bear this well for seven or ten minutes. The food should be easily assimilable, not necessarily milk or beef-tea only, but egg, custard, blancmange, jelly, sponge-cake, &c.

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* "The Bronchial Catarrh of Children," *Edin. Med. Journ.*, Oct. and Nov. 1886.

For medicinal administration, bicarbonate of potash (F. 22), nitrate of potash, iodide of potassium or sodium and spirit of nitrous ether (F. 37) favour the liquefaction and discharge of the products of the catarrh, and are therefore applicable mostly in the earlier stages of the disease. If the child is fairly robust and there is much fever, aconite, antimony, or ipecacuanha in small doses (a drop every hour) are all valuable in turn, and when there is reason to suppose the existence of much collapse, or when the dyspnœa is great without much fever, the tincture of belladonna combined with a little potash and soda, is useful. If the prostration is great carbonate of ammonia and ipecacuanha wine (F. 1) in small doses to aid the expectoration, make a good combination, or a mixture of ammonium carbonate with ether (F. 2) may be given. In severe cases, when there is evidence of over-distension of the right side of the heart, as is specially likely to happen when an acute exacerbation supervenes in a child who is already the subject of chronic bronchitis, great benefit sometimes results from the use of leeches; one, two, or even three may be applied over the sternum or over the liver, and will often give almost immediate relief. As the secretion from the bronchial tubes becomes more fluid an emetic is sometimes useful in clearing the tubes—a teaspoonful of the vin. ipecac., or five grains of the powdered root. Alcohol is often beneficial in severe bronchitis; it is best administered as brandy or rectified spirit. Subsequently a little syrup of squills, with the lacto-phosphate of lime and iron, may be given. The bowels should be kept gently open by aperients, as may be necessary; and, in the later stages, quinine may be useful, as well as cod-liver oil and other general tonics and restoratives.

Chronic Bronchitis is sometimes the result of an acute attack, or several such; it sometimes remains after whooping-cough; sometimes it is the sequel of atelectasis; and sometimes all we can say is that it exists, but how it came about there is no evidence to show.

Dr. Donkin very rightly lays much stress upon the occurrence of these insidious cases. Many of them he thinks are due to some hereditary weakness, and are associated with an early developed emphysema, the parental history being one of asthma and bronchitis.

In the milder degrees it may be seen in many children as a more or less permanent state. Always a little wheezy and short of breath. They are always "catching cold," and then temporarily they are very short-winded, perhaps a little feverish, and the râles in the chest are increased.

In more pronounced and confirmed conditions the child is more or less blue, with short breath and a deep chest, flattened from side to side, with a prominent sternum; the finger-ends are bulbous; it moves about in a lethargic way, as if life were an exertion, and has a frequent short moist cough. Sometimes the chest is full of moist râles, both large and small; sometimes there is little to be heard, except that the inspiratory murmur is clipped or shortened, and somewhat laboured. A long expiratory murmur is not, I think, a very marked feature of bronchitis in childhood. In the more advanced cases, the cyanosis and clubbing of the fingers may be extreme; the inspiratory recession of the lower and lateral parts of the thorax is very great. There may be evidence of distension of the right side of the heart, in the fulness of the veins and epigastric pulsation; but the lungs, being emphysematous in front, do not often allow of the detection of any increase of the præcordial dulness on the right side, even allowing that it occurs to the extent that is sometimes represented; but for my own part, I feel sure that dilatation of the right side of the heart displaces the impulse to the left quite as often as it enlarges the præcordial area to the right. The copious expectoration of pus, and sometimes of offensive pus, occurs in older children, but I do not think it is often seen in simple dilatation of the bronchial tubes.

Morbid Anatomy.—Such cases as these are apt, in the end, to be fatal by the repetition of the attacks; each leaving the lung in a worse state than it was before, and the child's condition thus being one of gradatim deterioration. The appearances usually found are patches of solid collapsed lung in various parts, more particularly towards the base and round the lateral region of the thorax; and the bronchial tubes are considerably dilated and full of thick pus. Thickening, roughening, and ulceration of the mucous membrane of the tubes have been described, but I think such conditions are rare. It seems to me to be much more remarkable how seldom there are any marked changes in the tubes commensurate with the extent of disease, if dilatation be excepted. The tubes are generally dark-coloured and congested, but not swollen or roughened in any way. The dilatation of the tubes is seldom other than a uniform one; saccular dilatations are quite uncommon. The lungs are usually moderately emphysematous along their anterior borders, at their edges elsewhere, and at their apices. In addition to the morbid appearances in the lungs, there will be found, more or less, those associated conditions of the viscera dependent upon the obstruction to the pulmonary circulation—viz., a large and probably dilated right heart, a nutmeg liver, and congested kidneys.

Prognosis.—These cases usually go on for a long time. Their history is for the most part one of chronic ailment, with intercurrent attacks of more acute inflammation, in all of which they are very ill, and the issue for the time doubtful. In one of these attacks they may ultimately die. Such cases, however, repay care; for again and again they may pull through a serious attack, when apparently in an almost helpless state, and I think one is justified in saying that, in many cases, something amounting to repair goes on. In young children, it is not incorrect to say that they may "grow out of it," for they greatly improve as their ribs stiffen. But there are other risks—one is of acute pleurisy, another of some ulceration of the lung; both these come about by the medium of dilated bronchial tubes. The secretions collect in them, near the surface of the lung or elsewhere, and, decomposing, set up an acute pleurisy, or some destructive broncho-pneumonia.

Treatment.—This is much the same as for other more acute cases. They require always to be kept very warm, to be warmly clad, exposed as little as possible to the vicissitudes of climate, and in any acute attack to be kept in bed. Alkalies are useful in promoting expectoration, and a stimulant may be added for the same purpose. Four or five drops of sal volatile with a similar quantity of tincture of senega, and some bicarbonate of potash with syrup of tolu, make an effective mixture at this time. In the later stage, when the expectoration is very copious, alum or gallic acid may be given. (F. 27, 38, 43.) Besides internal remedies, daily friction of the back and sides of the chest by soap liniment or simple oil seems sometimes to be of service. Later still, these cases usually do well upon mild ferruginous tonics. Quinine is also advised at this stage, and there can be no objection to its administration in half-grain doses three times a day. Quinine is best administered in milk, but it may be given with syrup or liquorice, and the recommendation of Meigs and Pepper, to combine it with a little curaçoa, is a good suggestion, if there be much repugnance to it in other ways. Maltine, cod-liver oil, and such like remedies, are also often valuable in improving the general health of the child.

Bronchiectasis.—It may be quite an open question whether this is to be considered a distinct disease; my reason for devoting a separate paragraph to its consideration is that it has been taught that there are special symptoms disclosing its existence, and one would like, therefore, to indicate what these are. It would appear that bronchiectasis in children occurs mostly between five and nine years, twelve out of my twenty being within that period. Bad pertussis frequently antedates it. From the notes of these twenty cases, there is expectoration, sometimes vomiting, of large quantities of thick, purulent, possibly offensive pus. The chest is usually deformed, either pointed in front or flattened on one or other side, and there is often an irregularly distributed dulness perhaps at one apex, and on one side or in patches in different parts of the lungs. The physical signs are those of coarse bronchitis, with occasionally some sharp râles here and there. It is but seldom that anything suggestive of cavitation is heard, when the dilatation of the tubes is at all generally distributed throughout the lungs; probably because these dilatations usually occur in the substance of the lung, and are surrounded by vesicular pulmonary tissue.

But there is another group of cases to which attention may be called in which there are definite *local* physical signs. In these there may be only dulness and deficiency of breath sounds at one examination, and well-marked signs of cavitation at the next, which again may as rapidly disappear. These changes often occur quite suddenly; an attack of coughing expels secretion which was filling the cavity, and so completely alters the physical signs. This rapid alteration of signs, when associated with copious expectoration and evidence of contraction of the lung, is very characteristic of this form of bronchiectasis, and is strongly against any tubercular process in a child; for it must be remembered that it is extremely rare to find in a child a chronic tubercular disease leading to slow fibroid change and cavitation in the lung as one sees in an adult.

Signs of cavitation in children with bronchiectasis have been found most commonly, in our experience, just below the angle of the scapula; we have also found them sometimes just above and outside the nipple. The bronchiectasis in these cases is almost always unilateral, but where the expectoration is offensive it not unfrequently happens that signs of bronchitis, or perhaps of slight consolidation, are present in the other lung, and one can well imagine that some septic material may be carried from the foul cavity into the bronchi of the opposite lung, and set up inflammation there.

There is usually more or less cyanosis, clubbing of the fingers, and a generally laboured breathing and indolent habit. With the exception, perhaps, of copious expectoration of pus, the symptoms often indicate not so much dilatation of the tubes as that condition of lung to which the dilated tubes owe their existence, and this may be sometimes a chronic bronchitis, sometimes extensive collapse, sometimes some old fibroid changes on one side or the other. We would also add, as very noteworthy, that it is by no means uncommon for cases of reputed bronchiectasis to give good evidence, upon careful examination, that they are instances of overlooked empyema, and it is important from the point of view of treatment that such cases should not be mistaken.

It has been supposed that there is some special significance in fœtor of the expectoration as an indication of bronchiectasis. Probably it would be more correct to say that when fœtor of the bronchial discharges exists there is generally some destructive disease of the lung or ulceration of the bronchial mucous membrane.

Morbid Anatomy.—The commonest form of dilatation is a uniform one. A section of the lung shows the tubes unduly large, and the scissors run along them with ease to the surface of the pleura. They generally contain more or less thick pus. Their lining membrane is red or livid; thickening is not a noticeable feature; the surface may look a little granular. This state of things is very usually associated with emphysema at the anterior and basal edges of the lungs, and also with some collapse. Saccular dilatation is rare, but when it exists the tubes are thin rather than thick, and form sections of cysts on the cut surface of the lung. These occur in the substance of the lung rather than near the surface, and are often surrounded by a small nodule of consolidated lung. An exaggerated form of this disease is met with occasionally in which these cysts are very numerous and very large, the section of, perhaps, one lower lobe being thickly studded with them. The lung tissue intervening is at most only emphysematous and the pleura is usually adherent. Very little is known about this condition; it has seemed to me that it might possibly be of congenital origin, the physical signs have been so little pronounced, and the evidences of the disease so obscure. There is yet a third condition, in which usually one or other base of the lung is contracted and condensed, and the tubes are more or less widely dilated. The dilatation in these cases is neither uniform, as in the condition already described, nor saccular, as in the other; yet on slitting them up along their course there is a good deal of irregular expansion, and the cavities so exposed are puckered by the existence of transverse rugæ. These also are found chiefly in the substance of the lung. This state of things is usually dependent upon some old pleurisy or chronic pneumonia.

The prognosis and treatment are much the same as for chronic bronchitis. These children require to be kept in the purest air, in as equable a temperature as possible, and, save when any acute attack threatens, in a dry atmosphere. If there is much accumulation of mucus in the tubes, an occasional emetic will relieve them, and for the rest they require tonics and fattening.

Atelectasis or **Collapse** signifies that the lung either remains in a fœtal condition or returns to a state of non-expansion. More or less, it is not uncommon at all periods of life, but it never reaches such an extreme degree, and therefore never puts on quite the same appearances, as in infancy. It affects sometimes a whole lobe; but more often patches here and there, the favourite spots being those which are liable to be placed at a disadvantage in the inspiratory expansion, and these are the anterior margins of the lungs, the edges of the lower lobes, and the middle lobe of the right lung, which last is a particularly frequent seat. Some writers distinguish between congenital and acquired atelectasis, but there seems little reason for this, since the explanation of all forms of collapse is practically the same. Anything which prevents the expansion of a lung, either in whole or part, will lead to collapse of the parts hampered. We see this in adults most strikingly. Supposing that some aneurismal or other tumour presses upon, or that some syphilitic scar obstructs, a bronchus, the lung becomes collapsed. Other changes may perhaps go on also which to some extent alter the appearance, but the essential condition is one of collapse. Take a case of chronic bronchitis: the tubes are full of pus, the air can find its way out and cannot get in again, and a lobular collapse is the result. Take, once more, a case of extreme weakness, from old age or fever or whatever you will; the feeble power cannot command a sufficient thoracic expansion, and the base of the lung suffers collapse. The air becomes gradually less and less in the unexpanded lung till complete airlessness is produced. In infancy, although the appearances of the lung thus shrunken may differ from the collapsed lung in adults, the causes at work are essentially the same, but with this addition, that whilst in adults the ribs are hardened, the muscles better educated, and the expansion consequently conducted under more fixed and regular conditions—in infancy the ribs are soft, and the muscles act more unevenly; in fact, the respiratory act is in process of being perfected so that we have a respiratory type which is sometimes almost undulatory, the different parts of the thorax expanding with comparative irregularity. I have already alluded to this, in mentioning the difficulties of auscultation in childhood, but what is there a source of confusion only is here also a predisposing cause of collapse. There is no need to dwell long upon the point, it is easily intelligible, and, granting it, there is a reason for the frequent occurrence sometimes of lobar, sometimes of lobular, collapse, and for collapse being such a frequent associate of all other diseases of the respiratory tract. It is thus that we hear of it as the result of chronic nasal catarrh, and of enlargement of the tonsils; of its association with bronchitis and broncho-pneumonia; of its occurrence in weakly and rachitic children. Further detail is hardly necessary; the immediate causes of it suggest themselves. For instance, a child is born in an excessively feeble state, perhaps prematurely; it lacks the strength to take a vigorous inspiration, and the lungs, in consequence, remain unexpanded. Here is fœtal collapse. Later on, may be, other debilitating conditions are at work, and again a gradual expulsion of the air takes place, and then collapse of more or less of the lung. At another time it is whooping-cough, with a good deal of bronchitis—or some catarrhal pneumonia—which leads to it: perhaps some severe snuffles or chronic tonsillitis; often the rickety state in which soft bones and a great tendency to bronchitis are combined. The student will be well able himself to suggest the many conditions under which this state occurs. It must also be remembered that in very young children it sometimes comes on with alarming rapidity—a mild bronchitis may perhaps have lasted but a few hours when the child becomes pale, with bluish lips, hurried and shallow respiration, and the chest-wall receding during inspiration.

Symptoms.—When it occurs within the first few weeks of life, the child is of puny build, often wasted, and with a weak whining cry. The chest movements are shallow, and there may be a want of resonance about the bases of the lungs without any decided tubular breathing. In cases, also, of great debility there is the same shallow respiration, but usually of sudden onset a short time before death. In other cases where it is the result of pneumonia or bronchitis, the symptoms are mingled with those due to those diseases. In cases of extensive collapse of some duration the lips may be blue, the fingers clubbed, the sternum protruding forwards, and the ribs deeply depressed and concave outwards, in the lateral region of the thorax and below the nipples. Posteriorly the chest is rounded, possibly deformed, and on inspiration the whole of the lower part of the chest makes a marked movement inwards towards the median line, increasing the depression already existing. Where collapse is extensive there may be considerable displacement of the heart towards the affected side, a point of some importance in the diagnosis. Percussion in such cases may give some slight loss of resonance in the basal regions, below the scapulæ. Possibly, on auscultation, some subcrepitant râles may be heard. In cases of long standing the right side of the heart becomes dilated and thickened, and the cyanosis is not only extreme but persistent. It is remarkable, however, how little the heart suffers in proportion to the amount of disease that is present. This is explained by bearing in mind that cases which seem to be of long standing are often not so. A child's chest is so soft and yielding that it will alter in shape within a few days, and one of the most distorted chests I have seen had assumed that condition within a month. Another reason is that defective aeration of blood in childhood carries with it defective blood-formation, defective nutrition and development, and wasting—and many such children are dreadfully thin. The right side of the heart is therefore eased of the distension which would of necessity follow the same amount of pulmonary obstruction in a fuller habit. Atelectasis, by hindering the blood current, may prevent the closure of the ductus arteriosus and of the foramen ovale. And here it may be mentioned that it is more than probable that atelectasis, by leading on to broncho-pneumonia and cheesy changes in the collapsed parts, is no uncommon source for the dissemination of tubercle. I have seen this so often in connection with the middle lobe of the right lung as to have very little doubt upon the point.

Morbid Anatomy.—The lung puts on a variety of appearances according to the extent of the disease. It may be in scattered patches, or confined to the hinder part of the lung, or to one or other lobe; but the aspect of the atelectatic or collapsed part is in all cases much the same. It is shrunken below the level of the air-containing lung, or, in the case of a whole lobe, there is much diminution in size. It is blue or leaden in colour upon the surface, the pleura looks thickened—it is not really so, and the feeling imparted to the fingers is rather that of a flaccid spleen. There is no crepitus; the tissue is quite flaccid, but solid; and scattered throughout are felt a number of more or less shotty bodies, which on section turn out to be thickened septa and bronchial tubes. The section is of a uniform dark claret colour, or may be streaked with greyish or pellucid fibrous septa. It would be uniform in surface but that the gelatinous-looking bronchial tubes project slightly. The tubes are dilated and often contain much pus. The diseased parts sink readily in water, and will often expand lobule by lobule when the lung is inflated by bellows. When the disease is one of small disseminated patches, then the fawn or buff tint of the spongy lung is studded with small raised irregular patches of pellucid-looking bluish or leaden-tinted tissue, the central part of each of which is a bronchial tube, with its swollen mucous membrane raised above the surrounding retracted lung. In these cases there is often much bronchitis (pus in the capillary tubes), and those parts not collapsed may be emphysematous, and over-distended with air.

The **histology** of these patches of collapse is even of more importance. In the disseminated and earliest form, where the small greyish nodules are scattered through the lung, we find that around the terminal bronchioles the pulmonary vesicles are simply flattened together, and present the appearance, at first sight, of thickened septa. There may or may not be some thickening of the walls of the bronchi. But in the larger masses of more solid tissue the changes are those, not only of simple closure, but also of interstitial inflammation. The pleura is thick; the fibrous septa between the patches and the adjacent lung—for the diseased parts are often shut off from the healthy lung in a very definite way by these septa—are much thickened; and not only so, there is clearly considerable activity of cell growth in the lymphatic elements around the small bronchioles, so that collections—such as have been called "miliary abscesses," though the term is a bad one—are to be seen in all parts of the section, and I think there can be no doubt that the whole area becomes, so to speak, glued together by a process of diffused interstitial cell growth.

These changes seem to me to be of great importance with reference to the results which may accrue from atelectasis, because they seem to show that, when collapse has existed for some time, a chronic interstitial pneumonia results, and the foci of cell growth, which are scattered about the sections, suggest, without any knowledge of the clinical course, that caseous or degenerative changes are not unlikely to follow. That this actually does happen, and that these foci are apt to become the source of the dissemination of tubercle, is exceedingly probable from the fact that the middle lobe of the right lung, a part unusually prone to collapse—not unfrequently after whooping-cough, which is a disease particularly liable to produce collapse—becomes the seat of cheesy broncho-pneumonia, which is followed by the development of tuberculosis.

In old-standing cases the right side of the heart is dilated and thickened; it may be fatty; the pulmonary artery is dilated and thickened. The liver is large, firm, and a little speckled with fawn-coloured points of fat. The spleen is firm, and the kidneys have a peculiar india-rubber-like consistency.

Diagnosis.—The chief difficulty lies not so much with the disease itself, as in being certified of the absence of other conditions. For instance, in very young infants a purulent effusion in one or other chest may easily be overlooked in the evident collapse of the lung which it determines. On the other hand, the collapse may sometimes be so extensive that the dulness that it produces may easily be mistaken for fluid. The evidence of displacement of the surrounding viscera towards the collapsed lung should, however, suffice to prevent this mistake.

Prognosis.—Perhaps no cases can look worse and less hopeful than those of extreme atelectasis; but it is to be remembered that these appearances can be quickly produced and may all disappear when the cause of the collapse is removed. A chest that has all the appearance of permanent distortion will resume a nearly natural shape as the lung beneath becomes gradually expanded. Collapse of the lung should therefore, if possible, be remedied as soon as may be, for the longer it lasts the more chance is there that chronic changes in the lung will succeed, and prove a great hindrance to the restoration of the thoracic contour. The gradual recovery of the natural shape of the chest is one of the surest means of judging; and, on the contrary, if the side of the chest remain flattened, and the sternum becomes more pointed or bulging, it is an equally sure indication that the bases of the lungs are not opening out, and that the anterior parts are becoming emphysematous.

Treatment.—All predisposing causes of collapse must be vigilantly sought for and treated. Chief of these are improper food, bad hygiene, and congenital syphilis. These determine rickets, and the soft bones of rickets invite the occurrence of collapse. Any indications of debility, in whatever form they may show themselves, must be treated in the requisite way. The immediate cause of collapse is obstruction to the ingress of air, and bronchitis and broncho-pneumonia being—in young children, and most of all in those that are rachitic—the commonest cause of obstructed respiration, require early recognition and careful treatment. As a rule, the expectoration of mucus from the bronchial tubes is best facilitated by alkaline remedies—such, *e.g.* as the bicarbonate of potash—and by stimulating expectorants, such as carbonate of ammonia and squill. If there be much accumulation of mucus, an emetic of mustard and water, or five grains of powdered ipecacuanha, may be administered. The child must be kept in bed, and in a warm equably-heated room, the atmosphere of which is moistened by the steam from a bronchitis-kettle. I object strongly to the ill-advised mummifying that is often seen—a mite of a child is perhaps encased in two or three layers of clothes, then a flannel bandage, then a poultice, and then perhaps a layer of well-greased linen—happy the doctor if it be not tallow. How can a weakly child breathe well in such a tomb? The chest may be lightly wrapped in a thin wool jacket, a warm bath given from time to time, and stimulating liniments applied to the surface. It is unadvisable to wrap the child up too much, as this provokes much perspiration and reduces the strength. At the same time, in fatal atelectasis the body temperature is apt to fall very low, and therefore the infant should be thoroughly but lightly encased in wool. As soon as possible, quinine, iron, and cod liver oil, or cream, should be administered, and plenty of bathing and friction to the muscles of the body, either with simple oil inunction or cod-liver oil, the only objection to the latter being its nastiness. Electricity has been recommended to improve the tone of the muscles and thereby to accelerate the recovery of the collapse, but it is a remedy which is not easy of application in young children, the sensation frightening them too much, and it is better to trust to gentle rubbing and kneading night and morning.

Asthma.—Spasmodic asthma is by no means uncommon in childhood, and perhaps it is best studied at that age to get at its true pathology. In childhood we not only see it in its purest form, but also a number of immature conditions, which are very helpful to the student of its causes. For example, some babies as soon as they suffer from any slight gastric disturbance, sometimes during teething, sometimes from some slight disagreement of food, whether from some little error in the diet or no, begin to wheeze, and this is often associated with some transient febrile disturbance as well. Perhaps the child is sick, or may be the doctor is called in and orders an aperient, and as soon as the dose has acted, the bronchitis, as it is called and as it may become, is relieved, and the child is well. This is the mildest and the commonest form of spasmodic asthma. It is never called asthma, it is called "bronchial catarrh," for true asthma probably requires certain anatomical conditions which are not to be found in babies, and it is replaced at that time of life by atelectasis; still the disease, quâ cause, is the same, and from this elementary and simple condition it runs, as we trace it in certain cases, through all degrees of severity of bronchial catarrh on the one hand, and through all stages of bronchial spasm into the extreme form of spasmodic asthma on the other. Asthma is said to be hereditary, but I could not say that it certainly is so in the sense that the asthmatic parent passes on the asthmatic tendency to the child, although this is so sometimes. But what there is no doubt about is, that asthmatic children come of neurotic stock, and that the disease is a nerve storm, to adopt Dr. Edward Liveing's happy term. And the importance of this fact I take to be vital in the treatment of the disease, for I see children in whom it is said to be produced by the slightest cold, and who in consequence are shielded in all possible ways from the vagaries of our climate. These poor little things hardly see the outside of their homes during the winter, and unless the wind is in the south, and it is dry and the sun shines, not very much of it in the summer, and the number of layers of clothing they swelter in is a painful subject of contemplation. Now I make bold to say that treatment of this kind, even were it successful in keeping the disease at bay, which it is not, never did anything but harm to the child, and never cured asthma. To do these children any real good, their pulmonary system must be habituated to its environment, not shielded from it, and they are to be made more robust in every possible way. Let some residential climate that suits the case be chosen, and then let the child be gradually accustomed to be out in all weathers, to indulge in all suitable games and occupations, such as riding, tricycling, and the like, and by these means the child's nervous system is built up; by such can asthma alone be cured; and in this way it is not incorrect to say, that a child grows out of his disease. In accord with this principle, arsenic may be given internally; it is one of the best of nerve tonics, and I generally recommend that it should be given for three weeks at a time with an interval of three weeks, over a long period—that is to say, over some months.

In addition to measures such as these, and hardly less important, is the matter of diet. There is no doubt, as Henoch and others insist, that asthma is often due to faulty digestion, or to a digestion at fault. But the indigestion would not be sufficient apart from the neurotic constitution. The asthmatic child is therefore to be fed on the plainest and most wholesome diet; with the utmost regularity; and the greatest care is to be exercised upon slow and methodical feeding.

But then there is the actual attack to be considered, and, alas! who shall say what will best control or stop the violent paroxysm? It is difficult to imagine a more distressing or ghastly sight than a severe attack of this kind, or one that more often seems to play with our efforts to relieve. An emetic is good for some, an aperient for others, for many some of the many fumes are good. The more successful of these are simple nitre, stramonium, Joy's cigarettes, and Himrod's cure. Such things as these, however, must not be applied too often, for they have their Nemesis in the increased sensibility they engender in the pulmonary surface to external stimuli; and while I have no doubt of their value and occasional necessity for the relief of the paroxysm, I have equally no doubt that I have seen the disease kept up and made worse by their too frequent use. When an attack threatens it is as well to give a saline aperient at once, and commence with iodide of potassium, and the ethereal tincture of lobelia; this is on the whole one of the most successful combinations that I have used of late years. A hypodermic injection of morphia, one-twelfth of a grain for a child six years old, sometimes gives speedy relief. The iodide with a little morphia is another useful remedy. I have also found some relief from the fluid extract of grindelia robusta, ten, fifteen, or twenty minims in milk, at hourly intervals at the onset of the attack, for two or three doses. Some think more highly of stramonium with the iodide.

There is, however, another large group of cases where the treatment is by no means such plain sailing, and which brings to the subject of asthma much of its difficulty. Asthma is in a large number of cases grafted on to, or rather induced by, some chronic disease, of the lung—emphysema, chronic bronchitis, &c. Even for such I think that the radical treatment must be largely tonic, and that great and permanent good is often the result. A great deal of discretion is required with respect to climatic treatment. Most of these children do well in a dry air, and dryness and sun is the combination most generally useful, but it is not always so. Thus, Torquay will suit some; Bournemouth, Totland Bay or Ventnor others; Tunbridge Wells or Malvern others; and of places further afield—the Riviera, Algiers, Madeira, &c.—there is a fair amount of choice.

The asthma of disease of the bronchial glands is discussed on page 318. Chapter xxviii. on Bronchial Phthisis may also be referred to.

CHAPTER XXIV.

PNEUMONIA.

PNEUMONIA, as in adults, is of two kinds—croupous and catarrhal; but whereas in adults the croupous is the common form and the catarrhal rare except as a consequence of tuberculosis, certain other specific fevers and so forth—childhood has been said to reverse this order. But, after all, there is no real distinction in this; it is true that in young infants catarrhal pneumonia is the commoner disease; but this appears to be because the conditions to which it is secondary, bronchitis and atelectasis, are so exceedingly common—as also the specific exanthems, measles and whooping-cough—the two diseases of young children that account for so many cases. We may therefore treat of the two diseases as in adults.

Acute Pneumonia (lobar pneumonia, fibrinous pneumonia) is, as in adults, a common disease. I have analysed all my cases to give some information on this and kindred points.

Out of 165 cases forty-five were lobular pneumonia with a mortality of twenty. Such a small number of cases of lobular pneumonia is in part accounted for by the fact that—being more common—less careful notes have been taken of them; and in part by many being included with those of bronchitis. One hundred and twenty were lobar; fifty-one of the left base, with fourteen deaths; seventeen of the left apex, with two deaths; thirty-four of the right base, with two deaths; eighteen of the right apex, with seven deaths. Apical pneumonia appears, then, to occur twice to five cases where the disease is basal; whilst disease at the right apex is the most fatal, and that at the left base next. Henoch gives seventy-four cases, two in which the disease attacked the entire right lung; two both lower lobes; twenty-one the right upper lobe; eighteen the right lower lobe; four the left upper lobe; and twenty-seven the left lower lobe. Barthez and Sanné give the following figures: right apex, 170; left apex, forty-seven; right base, forty-one; left base, sixty-nine; middle of lung, forty-nine; the greater part of one lung, thirty-two cases—total, 408. As regards the mortality, my figures are open to the objection that four-fifths were from out-patients. It is therefore probably higher than it need be. I have made no mention of double pneumonia, because in all these cases it was essentially one-sided; but in several cases patches here and there were discovered from time to time in the course of the disease, which makes me agree with the opinion of the late Dr. Charles West, that double pneumonia is not uncommon. There is some difficulty in being sure of the fact in the absence of an autopsy, for the sounds of consolidation are transmitted from side to side, particularly about the root, with great readiness; and it is also quite common in the auscultation of the lungs of children suffering from pneumonia to meet with evidences of consolidation at one visit which have gone at the next, or within a short time, and which must, I think, indicate a still more ready interchange of collapse and expansion than has, possibly, hitherto been appreciated, notwithstanding all that has been written on the subject. For this reason I hesitate to say that the disease attacks one side more frequently than the other, but it is usually stated that disease of the right side preponderates.

Sex.—Of my cases, seventy-seven were girls and fifty boys. This is not in accord with general experience, but, as is well known, different sets of statistics are liable to give contradictory results. It appears pretty certain that, taking a large number of cases, pneumonia occurs more often in boys than in girls; but I give my own numbers for what they are worth.

Age.—Lobar pneumonia attacks children at a very early age. Thus eighty-two of ninety-three were under five years; fifty-one of these were under two, thirty-one between two and five. There is, however, this difficulty to contend with, that it is impossible to exclude a certain proportion of cases of catarrhal pneumonia; for catarrhal pneumonia in severe cases is very liable to go on and consolidate a whole lobe. The younger the child, the more is the disease associated with bronchitic symptoms, in which the disease may often originate; the older the child, the more likely is the disease to have a sudden onset, perhaps by convulsions, to resemble the acute croupous pneumonia of adult life, and to be wanting in all the signs of bronchitis.

Morbid Anatomy.—The *lobar* pneumonia of childhood, as seen in the post-mortem room, differs from that of the adult in wanting the distension or solidity, and also the granular or dull rough surface which is so characteristic. As in adult life, it is often associated with pleurisy. The child's lung is smaller, denser, darker coloured than natural, of a bluish, violet, or leaden tint, and the cut surface is comparatively smooth. It is often very finely sanded, and may look vesicular, or almost gelatinous. When the disease has progressed some few days, the surface thus described is mapped out with grey lines of thickened interlobular septa, and is generally studded over with circinate patches of granular, yellow or yellow-red colour. These are the terminal bronchi with the pulmonary vesicles around them full of inflammatory material, on its way towards grey or fatty changes. The intervening parts are solid, dark-coloured, and scarcely granular. They are more solid than the solidity of simple collapse; less so, at any rate less bulky, than the lung of acute croupous pneumonia as seen in the adult. This is the condition which has no doubt given rise to so much questioning and discussion—some calling it collapse, others pneumonia. I shall not, perhaps, better matters much by saying that it is neither one nor the other; but, none the less, such a statement is strictly true. In childhood the respiratory movements and the circulatory conditions are not exactly the same as in adults. As I have before said, if we listen over a child's chest we frequently hear that now one part, now another, is moving more fully, depending upon a less uniformly equable expansion of the chest; and with dissimilar conditions come dissimilar morbid changes. The common form of pneumonia in early life is due to a complex series of changes: in part, and no doubt a prominent part, due to collapse; in part to catarrhal changes in the tubes and air-vesicles; in part to blood stasis simply; in part to swelling and thickening of the connective tissues surrounding the smaller bronchi and the septa of the lung. These last-mentioned conditions are very prominent features of the pneumonia of childhood, while the exudation of fibrin is of limited occurrence. I am by no means sure also whether some process of adhesion may not go on in the walls of the inflamed air vesicles. If not, they become much thickened and fibroid-looking, and in parts of such lungs the vesicular structure may be quite obliterated, and the observer appear to be looking at an unbroken field of fibro-nucleated tissue. It is most difficult in some cases to say what is the exact nature of the changes histologically; but this I know, that appearances quite unlike those of the acute pneumonia of adult life often present themselves. Neither are such changes comparable to those met with after compression by fluid. The peculiarities in the anatomical appearances have been described by several writers. Rilliet and Barthez ascribe them, in part, to the interstitial exudation to which I have alluded; others to a lessened amount of fibrinous exudation. I should suppose that both these departures from the adult type are of importance. The absence of fibrinous exudation may, however, be particularly insisted upon, because, if such be the case, it will be apparent how difficult it must sometimes be to distinguish between pneumonia and collapse of the lung.

The nature of the later stages of a lobar pneumonia in children is also by no means free from obscurity; but from what is seen in some cases of lobular pneumonia and from an occasional case of fibrinous pneumonia, it has been more surmised than proved that there is some such change as that denominated grey hepatisation, and through which resolution comes about. Nevertheless, remember that children hardly expectorate at all; nor are they in many cases troubled much with mucus in the tubes. The breathing has been said to be easy in these cases, in contradistinction to the labour of bronchitis; therefore, probably in many cases some process of liquefaction and absorption occurs; in fact, that which is occasional in the adult is common in childhood. In the more chronic cases no doubt there is a tendency to the formation of patches of cheesy pneumonia, or to a condition, presently to be described, in which a considerable part of one lobe may be converted into a solid cheesy mass.

Occasionally well-marked hepatisation is seen. For example, a boy, aged two and a half years, admitted into the Evelina Hospital, and dying within a few hours of admission, was found to have well-marked grey hepatisation of the upper lobe, commencing apparently in the lower part of it and spreading upwards, leaving the actual apex free. The case appeared to be an ordinary acute croupous pneumonia, clinically and otherwise, but a large mass of caseous glands occupied the mediastinum at the bifurcation of the trachea.

Causes.—On bacteriological grounds one might have thought that a sharp distinction could be drawn between the various forms of pneumonia; and to some extent undoubtedly this is possible. The variety of pneumonia which is characterised clinically by a sudden onset with vomiting or convulsions, and by a continuous pyrexia ending in a crisis about the eighth day, is associated in most cases with the presence of the pneumococcus in the lung, and this micro-organism has been regarded as the specific cause of such croupous pneumonia. But from observations which we have made at the Hospital for Sick Children, Great Ormond Street, and which others have made elsewhere, it is equally certain that the pneumococcus is present also in many cases which run no such characteristic course, and which both clinically and pathologically are ordinary cases of catarrhal pneumonia, or broncho-pneumonia, sometimes lobular, sometimes lobar, in distribution. In such cases the pneumococcus may be found in pure growth, or may be associated with streptococci or staphylococci. Of other disposing or predisposing factors, some think much of chill; others of atmospheric disturbances; others of septic conditions, &c. All, however, seem to agree that a child attacked once may be so several times. It is more common in the strong than in the weakly, and in the winter and spring than in the summer months.

Symptoms.—Acute fibrinous pneumonia is, as in adults, a disease of sudden onset. But this may be masked in young children by diarrhœa and symptoms of gastro-enteritis. There may be rigors or convulsions, headache, vomiting, muscular pain, pain in the side, and high fever (103° to 105°). Dr. Emmett Holt * states that repeated attacks of vomiting occurred in half his cases, and that convulsion was the next most common symptom of onset. Dr. Donkin remarks that of all the acute diseases of children, excluding cerebral affections, pneumonia is the disease most often ushered in by vomiting; scarlatina coming second to it in this respect. It is a disease of a few days only, ending in a crisis, but it may last any time from three or four days to seven, eight, or nine. It is usually associated with pleurisy, and this to some extent masks the disease, and gives its symptoms a special colour. It is not uncommon for the pain to be referred to the abdomen, probably as a result of some diaphragmatic pleurisy. Where the lung signs are slight it is easy to be misled by this abdominal pain, which may be the only complaint. The pain may be very acute for a day or two, and the features, particularly if the child be very young, may become pinched. The cough is stifled, or with it there comes a cry or sometimes a shriek. As between bronchitis and pneumonia, Meigs and Pepper allude to a distinction which is not unserviceable, that the child with pneumonia breathes easily, though very rapidly, whilst the bronchitic gets his breath with labour. Of course, with much pleurisy this is modified, and the child with acute pleuro-pneumonia sits up in bed giving vent by turns to short grunts and a harsh, dry, short cough. The child's face is flushed, its skin hot and dry, the lips perhaps covered with herpes. Some cases are ushered in with violent cerebral symptoms, and have been described by Rilliet and Barthez as a distinct variety—"cerebral pneumonia." In frequently recurring convulsions, and in headache, vomiting, delirium, and drowsiness, these cases may resemble, and be mistaken for, meningitis. Hillier and others consider such symptoms more likely to occur with pneumonia at the apex than elsewhere, and this has certainly been our experience at the Evelina Hospital. It may be worth while to point out, in reference to this observation, that some have thought that apex pneumonia in adult life is not only severe, but liable to own a septic origin. Possibly also, the fact already insisted upon, that a pneumonia of the apex is often a pneumonia of the root of the lung, may also have its meaning in this respect. The disproportion between respiration and pulse (normally 3½ or 4 to 1) is usually well marked, the former rising to sixty or seventy per minute. The alæ nasi dilate with inspiration until the severity of the disease lessens. The tongue is naturally often thickly furred; vomiting may be obstinate for the first day or two; the bowels are confined; the urine scanty, and its chlorides absent.

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* "Pneumonia in Young Children" (*New York Medical Record*, Feb. 14, 1885), a paper of the picturesque fulness of detail of which it is impossible to speak too highly.

The temperature, after continuous elevation to 103° or 104°

for a period which varies from four to eight days in the majority of cases, generally falls suddenly to normal, or below it, and may rise again slightly at night for a fortnight, before the balance finally rights itself. The crisis is sometimes so sharp that Dr. Newnham, during a four years' tenure of the house-surgeoncy at the Evelina, has frequently been summoned by the nurses to these cases; the sudden fall from perhaps 103° or 104° to below 98° having suggested that something was going wrong with the child. If, after the crisis, the temperature should again rise, particularly at night, the formation of fluid, and perhaps of pus, in the pleura, or some fresh mischief in the lung, may be suspected. These acute forms of inflammation of the lung are not at all uncommonly succeeded by empyema. Associated with the crisis there is usually copious perspiration.

Recovery after the crisis is often astonishingly rapid; the solidification, as judged by the physical signs, will sometimes disappear within a day or two, nor is it necessarily accompanied by much evidence of softening in the way of mucous râles. Steiner makes a note that in several cases he has found complete absorption to go on without the occurrence of any moist râles.

Physical Signs.—In a typical case there will be more or less rapid onset of tubular breathing, associated with dulness on percussion, the latter often deepening as the case progresses, by reason of its frequent association with pleuritic exudation either of lymph or fluid. There may also be an appreciable diminution of movement on the affected side, which together with increase of voice sounds and of vocal fremitus may complete the evidence of consolidation. But in many cases the signs are far more equivocal.

The *percussion* is often misleading. With pneumonia at the base there is often a slight increase of resonance above the normal at the apex, especially in front, on the same side, and by contrast the apex of the opposite side shows apparently an impaired note which is in reality the normal: this difference is accompanied often by harsh exaggerated breath sounds on the side on which the resonance is increased, so that on the sound side the breath sounds appear diminished by comparison. Mistakes can only be avoided in such cases by careful examination of the whole of the chest before coming to any conclusion as to the site of the pneumonia.

With consolidation occupying a large extent of the lower part of the lung there is sometimes an almost skodaic or boxy note at the apex; a sign which might lead to a mistaken diagnosis of pleural effusion, with which it is more commonly present. In any case where the symptoms point to pneumonia, and the presence of signs is not obvious, the frequency of apical pneumonia in children should be remembered; sometimes with very careful percussion just below the clavicle, or by direct percussion of the clavicle itself, some slight impairment of note may be detected pointing to early consolidation at the apex.

Dr. Lees has pointed out that in children especially, it is by no means uncommon to find that in addition to one well-marked area of dulness there are often smaller areas in both lungs, of slight impairment of resonance. It seems likely that these are in most cases indications of patchy collapse, but they should always be watched carefully, for occasionally undoubted evidence of consolidation appears in them, and what began as a one-sided pneumonia may become a double pneumonia: such an occurrence is, however, in our experience quite exceptional. A good deal of information is also conveyed to the practised finger by the want of elasticity of the chest-wall, which co-exists, it may be, with pneumonic consolidation, or with pleuritic effusion. A cracked-pot sound may also often be elicited under like conditions, only it is not worth while to thump the poor child to obtain it, as it conveys no additional information, and it might even mislead the novice.

On *auscultation* bronchial breathing may be detected within a few hours after the onset of the illness, and in most cases is to be heard within a day or two after the beginning of the disease. But it is well to remember that bronchial breathing is sometimes slow in making its appearance, and this, in cases in which one would expect it quickly—viz., those which from general symptoms seem very acute. Dr. Hillier notes this delay in the appearance of bronchial breathing in cases of apex pneumonia. But not only is there this delay in the appearance of a morbid quality of respiration; the vesicular murmur is sometimes absent altogether, and the lung appears to be almost silent—so much so indeed, that, in some cases, it seems possible the tubes may become filled with fibrinous coagula, which bar the entrance of air into the solidified part. The following case illustrates this and other points very well.

A little Jewish boy of six was admitted with excessively acute symptoms and a temperature of 104°. I saw him first on the fourth day of his illness, and the respiration was so nearly absent over the apex and in the axilla of the left side that I suspected the presence of fluid. A needle was passed into the chest in the axillary region but nothing came out; and at my next visit well-marked tubular breathing had developed all over the apex of the lung, back and front. The symptoms continued severe, although he gradually improved, till the eighth day, when, between nine and twelve mid-day, the temperature fell from 100° to 97°, but it rose again at night to 101°, and after that, for two or three days, rose even to 102° at night. A careful examination again revealed absence of respiration over the front part of the lung; but now, in addition, the heart-sounds were distinctly louder to the right of the sternum than in the proper position, and, although the præcordial dulness did not appear to be altered, the pulsations were decidedly most marked behind the sternum. An exploring syringe was again passed into the chest in the axilla, in the same spot as before, and some pus was withdrawn. This was evacuated by incision on the fourteenth day of his attack, the chest was drained for a few days, and he rapidly got well.

Barthez and Sanné allude to a case where the respiratory murmur was absent throughout, and the disease in consequence thought to be pleuritic effusion, but at the autopsy the pleura was healthy and the lung entirely hepatized. It will often happen, too, that patches of consolidation are only to be recognised during a cry—when bronchophony or tubular breathing, not otherwise audible, become so.

There is occasionally heard a peculiarly harsh inspiration in the earliest stage of pneumonia; but the respiration is often faintly bronchial rather than harsh. The fine dry crepitation is often absent. When the consolidation begins centrally, it may be some days before much is heard at the surface of the lung. Careful examination should then be made daily over the root of the lung. It is but seldom that bronchial breathing, when it exists, cannot be detected there, although in this region its presence should always be received with caution.

Complications.—Acute pleurisy and acute pericarditis are met with; the former commonly, the latter rarely. Every degree of pleurisy is met with. Empyema is in many, perhaps the majority of cases secondary to pneumonia, and in every case where dulness persists or the temperature is irregular after the crisis in acute pneumonia, the possibility of this complication must be remembered. Suppuration elsewhere may occur. Suppurative meningitis and suppurative pericarditis are not so very rare after acute pneumonia, but these occur almost always in association with empyema or at any rate with a thick layer of lymph on the pleura. Suppurative peritonitis occurs similarly, and we have seen suppuration in one or more joints, and also in the subcutaneous tissues, and in all these various suppurative lesions we have found the pneumococcus usually in pure growth. Malignant endocarditis also sometimes complicates pneumonia in children, but this is very rare.

Otitis media is a frequent complication in this as in other acute diseases in childhood.

Diagnosis.—Anything which produces consolidation of the lung may resemble a pneumonia in some respects. I have noted, as specially worth caution, that fluid at the base of the lung, by leading to pressure upon the lung, will frequently give rise to bronchial breathing at the apex under the clavicle, and so to a suspicion of the existence of pneumonia. This is more liable to occur in chronic cases of effusion, and therefore in those where the elevation of temperature is unlike that in pneumonia. Perhaps, however, the best method of distinction is to take this axiom, that whenever there is evidence of fluid at the base of the lung we must receive with caution any evidence that there may be of pneumonic consolidation at the apex.

Fluid collected in the front part of the pleura may simulate pneumonia. I have seen this twice or three times, and have cleared up the doubt on more than one occasion by the use of the exploring syringe in the second or third intercostal space.

In pleurisy the temperature is not usually very high; vocal resonance is diminished; there is often a peculiarly damped tubular breathing of sniffling character, and the viscera may be displaced.

Acute caseous consolidation may also have to be distinguished.

The disease is less rapid, the temperature less high and more oscillating, and the previous history, family history, and general conditions must all be taken into account. Typhoid fever may also be simulated in cases of pneumonia in which the physical signs of consolidation are latent or the cerebral disturbance pronounced.

Meningitis may be discerned by its lessened and oscillating temperature; by the irregularity of pulse and respiration, and by the absence of any quickening of the latter, of dilatation of the alæ nasi, or of physical signs.

In atelectasis, although the signs of consolidation may be considerable, the fever is little or none; and there is in addition a lividity and labour of respiration quite uncommon in pneumonia.

Acute tuberculosis gives signs, if any, of acute bronchitis, not pneumonia; although several cases have occurred to me in which, what during life appeared to be pneumonia, proved at the autopsy to be a case of acute tuberculosis with much solidification of the lung. But in all these cases there has been an intense ashy pallor which should arouse suspicion.

Fibrinous pneumonia, in its acute onset with vomiting and convulsions, may simulate scarlatina; in this case a few hours must be allowed for the nature of the disease to declare itself. It may closely resemble malarial fever, but may be distinguished, according to Holt, by the marked morning remission which mostly occurs in malaria, and also in the less extent of prostration which the latter shows. The onset of acute tonsillitis sometimes gives rise to suspicions of pneumonia.*

Prognosis.—Acute fibrinous pneumonia is rarely fatal. But if we take all cases of lobar pneumonia as they occur, the mortality is by no means inconsiderable—about one in every five, though figures of this kind are not very useful.

An opinion can only be reliable when based upon a careful survey of the condition of the child. An extensive or double pneumonia must necessarily be regarded with anxiety, however, hopeful, until the crisis comes, on account of the extent of lung involved; and any degree of lividity of cheeks, or lips, or finger nails is of bad omen.

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* For this paragraph of hints I am indebted to Dr. Emmett Holt's paper already quoted, p. 355.

Treatment.—In acute pneumonia the child should be placed in a warm bed in a well-ventilated room; it is to be warmly but loosely clad in flannel. For local application to the chest, the most orthodox in this country is the linseed poultice, but I have for some time discarded it in favour of a spongio-piline fomentation—and this for the cold compress advocated by the Germans. Of late, at the suggestion of Dr. Lees, I have resorted frequently to the ice-poultice or ice-bag, and am well pleased with the results. It reduces the temperature, and has, in some cases, I think, prevented the full development of the pneumonic exudation. Much caution, however, is needed in its use, and it is doubtful whether it is advisable to use it unless skilled and reliable nursing can be obtained. Great care must be taken that the extremities are kept warm, with hot bottles if necessary, and on the least sign of lividity or collapse the ice-bags must be removed. The temperature also must be carefully watched; and it is well to remove the ice-bag if the temperature fall below 100°. If it be considered advisable to apply counter-irritants, this is best done, not by putting mustard in poultices, but by applying a mustard-leaf to the part for as long as may be requisite. The food should be milk and beef-tea, egg and farinaceous diet. Internally some simple saline, such as nitrate or citrate of potash (F. 21), may be given, and if there be much pleuritic pain, a dose of Dover's powder should be given at once. A child of six or eight years may have two and a half or three grains of Dover's powder two or three times a day. In very acute cases I give aconite tincture, a drop every hour for a few hours. It is useful in promoting perspiration, and in generally quieting the severity of the symptoms. Antimonial wine, in doses of one or two drops every hour, is also a very useful, though old-fashioned remedy. If notwithstanding these measures the temperature remains very high, and the child seems to be getting worse, then phenacetin or acetanilide in doses of one or two grains may be given, or a bath, warm, tepid, or cold, may be resorted to. Of late years very favourable results have accrued from tepid and cold baths, but they will not probably be often of use; an ice-bag amply suffices for most cases, and if they do not speedily get well, they become bronchitic, or pus forms in the pleura, &c., so that they are not then fit for such a plan of treatment. The introduction of antipneumococcic serum raised hopes that we might have some specific remedy against the toxin of pneumonia, but these hopes have not been justified. Dr. Lovett Morse, indeed, has recently reported eight cases of pneumonia in infancy treated thus with no benefit whatever. If there is much exhaustion, some brandy should be given, half an ounce up to two ounces or even more, according to the age, in the course of the twenty-four hours. When any suspicion of a bronchial origin attaches to the disease, and indeed in many other cases, the atmosphere should be rendered moist by steam, and some stimulating expectorant should be given to the child, such as a few drops of sal volatile (it may be combined with a little senega and ipecacuanha wine if necessary), and made palatable by syrup of tolu. The chest should be well covered with wool or fomentations, and a little alcohol given.

Results.—If we except caseous bronchial glands and tuberculosis, which are not uncommon, there are few results of an acute pneumonia. I have once seen a red, indurated condition of the lower lobe as the result of some chronic pneumonic process, after acute pneumonia, problably from injury. The affected lobe sometimes becomes matted down into a small fibrous mass of grey or reddish colour, with thick septa throughout it, and the bronchial tubes widely dilated. The pleura is generally thick in these cases, and it is a question how far the disease may have originated in pleurisy rather than pneumonia. I have also seen three cases in which there was considerable fœtor of breath, so much so as to make me suspect the existence of gangrene of the lung, although in all recovery took place.

Chronic Pneumonia.—There is very little to be said of this disease which is not included under other headings—for instance, as the result of chronic pleurisy, of rare cases of pneumonia, or of atelectasis, one or other lobe becomes solidified and ultimately converted into a tough, fibrous, contracted relic, with its bronchial tubes thickened and dilated. Pleurisy, and particularly empyema, is the commonest cause of this condition, save and except it occur in the middle lobe of the right lung, which appears to undergo some such changes as these in consequence of atelectasis, or that and broncho-pneumonia combined, which is so common there. Pleuro-pneumonia at the apex is sometimes followed by chronic apical disease of a destructive and tubercular nature. Then, again, there is the cheesy solidification of parts of a lobe, which may by some be considered as a retrograde change in a pneumonic lung, or a special form of chronic pneumonia. There is one other condition—viz., the syphilitic pneumonia of infants; this must, I think, be rare, as I have only seen one or two microscopical specimens, but it has been described by various writers under various names, white hepatisation, perhaps, being that which best identifies it. Dr. Greenfield has given a careful description of a case which seems to have been of this nature, and I shall quote from this.* The child, a female, aged twelve months, died in the out-patient room of St. Thomas's Hospital. There was no distinct evidence of syphilis, but circumstances in the family history rendered its existence extremely probable. The right lung was completely consolidated, in a state of full expansion. There was slight recent pleurisy, without thickening. The section was yellowish-white, the cut surface smooth and slightly shining, differing markedly from the ordinary grey hepatisation of acute pneumonia. The tissue, being firm and tough, exuded but scanty fluid, and minute bands of fibrous tissue ran everywhere through it. The microscopical characters of the disease show it to have been a condition of extreme and active fibrosis, in which the septa and walls of the air-vesicles were thickened by a fibro-nucleated tissue in some parts to complete obliteration of the pulmonary structure. My friend and colleague, Mr. Symonds, has supplied me with sections of another case,† undoubtedly syphilitic, for the liver showed abundant and remarkable syphilitic hepatitis. The child was one month old. In the recent state the affected part of the lung was in a solid fleshy condition. Microscopically, it shows all the features described by Dr. Greenfield—the excessive fibro-nucleated growth, the extreme vascularity, dilated, thin-walled capillaries running in all directions, and an inextricable jumble of fibrous tissue with still remaining air-vesicles, the epithelium of which is in many parts intact, in some undergoing proliferation, making it difficult to be sure that the cells themselves are not helping forward the process of fibroid growth. I would take leave to add, that the histological appearances of the earlier stages show also how difficult it is in many cases to distinguish between the changes of atelectasis and those of interstitial pneumonia. Looking carefully over this specimen, it is clear that collapse of the air-vesicles plays a large part in the process ; and, comparing it with others of atelectasis, it seems equally clear that in them the hyperplastic process, which may go by the name of "interstitial pneumonia," is by no means absent, although in a less pronounced form.

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* *Trans. Path. Soc. Lond.*, vol. xxvii. p. 43.

† This case is recorded in the *Trans. Path. Soc. Lond.*, 1886, vol. xxxvii. p. 124.

Lobular or Catarrhal Pneumonia : Broncho-pneumonia.—As a primary disease this is an affection particularly of infants ; indeed, after the first three or four years of life it is by no means common. Even when it occurs in infants it is preceded in so many cases by an acute bronchitis or by atelectasis, and these in turn by rickets, that one might doubt whether under these circumstances it is rightly called primary. The association of broncho-pneumonia with gastro-enteritis is also very common in infants, and it is sometimes difficult to be sure which came first.

Beyond the age of infancy broncho-pneumonia is generally secondary to some other disease, especially to some of the specific fevers, whooping-cough, measles, and diphtheria, but it may be the terminal event of almost any long and exhausting illness, and as such is seen in a variety of conditions too numerous to mention. Lastly, perhaps one should mention here, not because of its frequency, for it is rare, but because of the difficulty of diagnosis, the broncho-pneumonia which results from a foreign body in the bronchus.

Symptoms.—There is often some previous history of ill-health—the child is rachitic, its chest deformed, or it has frequently suffered from colds and coughs. The symptoms are acute enough ; nevertheless, there is hardly perhaps that painful severity about them which may be seen in the fibrinous cases. The temperature does not average so high a range, although 105° or 106° is occasionally reached ; the pain is less, the skin is more moist. In place of a flushed cheek there is pallor and there may be lividity, and there will be more bronchitis, which is equivalent to saying that the respiration will be more laboured. The child lies propped up in bed, with very rapid shallow respiration—perhaps 100 per minute—and dilating alæ nasi.

Examination of the chest may show the ordinary physical signs of broncho-pneumonia, patchy dulness, sharp crackles, and bronchial breathing; but it must be remembered that these signs are not always present; a little more intensity and sharpness of the râles at one spot than elsewhere, or perhaps slightly high pitched breath sounds with some doubtful flattening of note on percussion, such may be the only signs, and it may be very difficult to say whether one has to deal with a case of acute bronchitis or of simple collapse, or with a combination of these conditions, or whether there is some broncho-pneumonic consolidation. In other cases again there is extensive dulness which seems to be limited to one lobe, perhaps to the apex of one lung, and it is only after a careful consideration of the previous history, the onset of the illness and the character of the temperature chart that one can decide whether the case is one of lobar pneumonia or broncho-pneumonia, a point of some importance in prognosis.

The course of the disease is very variable, but, as a rule, it ends in no definite crisis. The temperature falls gradually, and the pyrexia has a more prolonged course than in lobar pneumonia —any time, in fact, from one week to six or eight, although here also with careful treatment the disease will sometimes clear up with great rapidity. It is not uncommon to meet with such cases in our ward devoted to whooping-cough, and to find the evidences of consolidation all disappear within a day or two, and the same applies to broncho-pneumonia from any cause. It must also be said that it is in whooping-cough that broncho-pneumonia finds its most lingering cases.

Occasionally after the temperature has been normal for a few days it will again rise, and a remittent or intermittent pyrexia will continue for a week or more, and this recurrence of pyrexia may be associated with fresh patches of consolidation in the lung; sometimes three or four such recurrences each separated by several days of normal temperature, will occur.

Diagnosis.—In the recognition of broncho-pneumonia there is usually but little difficulty; we have already said that care may be necessary to distinguish it from bronchitis and from collapse. But a far more difficult matter is the diagnosis of its cause: is it a simple broncho-pneumonia? or is it the result of the dreaded whooping-cough? or is it possibly a tubercular process? These are the questions that have to be decided, and we may say at once that the decision will call for the best powers of judgment we possess.

The disease which is, perhaps, most often overlooked in a case of broncho-pneumonia is whooping-cough. Again and again cases which seem to be simple broncho-pneumonia declare their true nature as the physical signs subside by a definite whoop. And this oversight may be almost unavoidable if the case be seen for the first time when pneumonia has already supervened, and for the previous history there is only, it may be, the vague statement of a mother, who has never seen a case of whooping-cough, and who has not recognised the character of the cough. Add to this the fact that the whoop often disappears completely during the acute stage of the broncho-pneumonia to return as the lung inflammation subsides, and it will be evident that the secondary character of the pneumonia may easily be overlooked. A broncho-pneumonia which is apparently primary, especially in children beyond the age of infancy, may arouse suspicions of tuberculosis which too often are confirmed by subsequent events. But one must not be in too great a hurry with a diagnosis of tubercle; many a case with signs of scattered consolidation which linger, it may be, for several weeks, and are therefore thought to indicate tuberculosis, recovers completely, and one can only suppose that the condition was one of simple broncho-pneumonia.

But, on the other hand, signs of acute broncho-pneumonia may be the prominent feature of an early tuberculosis, and the rapid subsidence of these signs as the disease becomes more chronic may give rise to too favourable a prognosis.

So long as careful examination detects the slightest abnormality in physical signs or any irregularity of temperature, one cannot be too cautious in prognosis. We may repeat here what we have said elsewhere, that it is necessary to take the temperature at least twice a day, morning and evening, and even then it is quite possible to overlook considerable excursions.

The **morbid anatomy** of lobular pneumonia differs from that of the lobar form in distribution, but not much otherwise. A section of the lung thus diseased shows an uneven surface, from the existence of eminences and depressions. According to the stage arrived at, so will the eminences be either simply dark-coloured from congestion, and their relations to the smaller bronchi perhaps not very distinct; or else actually solid, with a central dilated bronchial tube containing pus. In the latter case the eminences will either be of a dark livid colour, almost translucent near the central bronchus, with no well-defined margin; or yellow or fawn coloured from the degenerative changes in the inflammatory products. In this way are produced clusters of nodules, the cut section being often finely granular; and these may run more or less together, solidifying the whole lobe, or part of it, and producing a nodular solidification which gives to the diseased part a somewhat peculiar feeling when grasped between the finger and the thumb. Histologically, the smaller bronchi are often very much thickened by a crowded cell-growth in their submucous tissue, and the air-vesicles around such affected tubes are full of inflammatory products; in proportion to the diffusion of the centres of inflammation, and to the duration of the disease, there is an approximation in appearances to the description given of lobar pneumonia. The smaller bronchi are often dilated.

Hillier describes lobular pneumonia as disseminated or generalised, and, when the latter, closely resembling the lobar form. He also alludes to a description by Ziemssen of chronic cases of this variety taking origin in collapsed parts, a change which sometimes involves a whole lobe. The appearances of this disease would seem to be identical with what has been here described as the common form of lobar pneumonia in children.

Prognosis.—Broncho-pneumonia in infants must always cause much anxiety, but one may say of this, and indeed of broncho-pneumonia in children of all ages, that cases which look quite hopeless may struggle through, and it is one of the diseases in which we are at least justified in comforting the parents with the trite maxim that " while there is life, there is hope."

Of symptoms, perhaps a gangrenous odour of the breath is most to be feared, indicating as it does a necrotic process in the lung, which often proves fatal; but we have seen recovery, even where this symptom was well marked.

A more frequent group of symptoms, and one that calls urgently for treatment, is that which indicates failure of the right side of the heart: lividity with restlessness, or worse still apathy, marked epigastric pulsation and extended cardiac dulness to the right of the sternum—these are symptoms that must always be regarded with anxiety.

Some writers, amongst whom are Dr. Holt and Dr. Lovett Morse, attach much significance to the pulse rate, and also to the temperature as guides to prognosis in this disease. The latter writer from statistics of a large number of cases * concludes that prognosis is good when the pulse is not over 140 or the respiration over 55; but although such symptoms undoubtedly have their significance, probably he will be wisest who bases his prognosis not upon isolated symptoms but upon the general aspect of the child, the presence of cyanosis, the extent of the physical signs, the absence or presence of rickets, and last but not least, the age; the younger the child the greater the danger in broncho-pneumonia.

As a complication of measles and of diphtheria, broncho-pneumonia is always serious and often fatal: the outlook is also bad when it occurs in rickety children; convulsions in such cases are usually followed by death.

The lingering course of catarrhal pneumonia introduces also other less immediate risks which should be kept in mind. They will be fully described in their appropriate section, but in the meantime this may be said, that the lengthy duration of many of these cases no doubt leads in some to choking of the lymphatic glands of the mediastinum and consequent caseous degeneration. Others may develop phthisis or acute tuberculosis, and others again may be permanently crippled by fibroid changes in the lung, by general dilatation of the bronchial tubes, or extensive and thick pleuritic adhesions.

These varied risks must not, however, be allowed to warp the judgment into a too gloomy forecast, for, notwithstanding all, it is still the happy record of experience that an illness of even many weeks is no bar to complete recovery, and that many a child too hastily pronounced to be phthisical has thus falsified his sentence.

Treatment.—What has already been said with regard to bronchitis and lobar pneumonia applies to some extent to broncho-pneumonia. Warmth, with good ventilation, is the first requisite, but is a combination which often requires some tact to secure. On the one hand, draughts must be carefully avoided, by screens or curtains if necessary, but on the other hand a stuffy room, of which the windows are scarcely opened in the twenty-four hours, ensures the worst possible atmosphere for a child whose urgent requirement is oxygen. A tent and steam-kettle are sometimes advisable, especially when the bronchial secretion is scanty and there is much dry cough; but, as we have already said, it is easy to overdo this treatment. The chest should be covered with a cotton-wool jacket in all cases.

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* "Archives of Pediatrics," Sept. 1904.

Counter irritation is often useful, especially perhaps in the early stage, when there is much bronchitis associated with the broncho-pneumonia.

Of drugs, ipecacuanha is indicated where the cough is dry and frequent, and may be usefully combined with ammonium carbonate (F. 1, 37, 47). Sometimes there seems to be a definite spasmodic element, a sort of asthmatic character, about the disease, even in infants; in these cases we have seen much benefit from belladonna, which may be given with ipecacuanha. Opium and its preparations are to be used with care in this as in other lung diseases; sometimes, undoubtedly, it is of great use, particularly in the early stage, when with considerable distress from dyspnœa and cough, the strength is nevertheless, well maintained; but at a later period when the child is becoming exhausted, and in addition to extensive consolidation there is much general bronchitis, an opiate is likely only to do harm.

When broncho-pneumonia persists as it often does for two or three weeks or more, we have thought that potassium iodide (gr. ij–v), which should be combined with a suitable dose of spirit. ammon. aromat. (1–10 minims according to the age of the child) is often useful.

In many cases of broncho-pneumonia stimulants are required sooner or later, and where any signs of exhaustion appear stimulants must be pushed. Carbonate of ammonia must be given in such cases freely; spirit of ether, too, is an excellent stimulant, but has the drawback of a disagreeable taste, and unless well diluted is apt to "take the child's breath away." The combination in F. 2 is in frequent use for these cases at Great Ormond Street. Strychnine, especially hypodermically, in doses of one minim or less, according to the age of the child, and repeated every three or four hours, may tide a child over the danger, when it appears to be dying of respiratory exhaustion and right heart failure. Oxygen inhalation is sometimes worth a trial, but we confess to having found the results very disappointing in children.

Last, but not least, we must mention abstraction of blood by leeches or by venesection as an invaluable help in the treatment of broncho-pneumonia, where there is dyspnœa with lividity, turgid jugulars, epigastric pulsation, and evidence of dilatation of the right side of the heart. Two, three, or more leeches over the sternum or over the liver, or the removal of one, two, or three ounces of blood, according to the age of the child, from the median basilic vein, saphena, or even from the external jugular, if necessary, may just turn the scale in the child's favour.

CHAPTER XXV.

TUBERCULOSIS—PULMONARY TUBERCULOSIS.

Tuberculosis in all its protean variety figures so largely in the mortality of childhood that we may well devote some space to the consideration of its general ætiology.

The tubercle bacillus is supposed to be the virus which, introduced from without, forms a nidus in some of the lymphatic structures, provokes caseation, and thence, by fertilising, becomes disseminated in all parts of the body. Experiments show that tubercle is propagated by inoculation only when the bacillus forms part of the virus which is introduced, in contradiction to previous less rigid experiments which pointed to the probability of any suppurative focus being sufficient for the purpose.* There is a disease also, well known amongst cattle, which, having much of the anatomical distribution and histological structure of tubercle, is capable of transmission from the diseased to the healthy animal by means of the milk from diseased cows. It has become practically certain that this tuberculosis of cows may be, and is, transmitted to children by means of milk, although as to the frequency of such transmission there is considerable difference of opinion. It has certainly been our experience that tuberculosis in early infancy while not uncommon is seldom seen in children who are entirely at the breast. Other observations are accumulating which go to show that, possibly under favouring circumstances, tubercular diseases may be transmitted from man to man; and, lastly, we have the features of the disease itself, which are in many respects those of a specific fever. Accepted then as the doctrine of the specific nature of tubercle must now be, it is necessary to add that, considering the infrequency of any direct contagion from man to man; considering, too, the history of the disease as it is seen in the lungs of adults for example, going slowly on over ten, fifteen, twenty years, with its times of quiescence, even of cure, and relapse, any one is bound to hesitate before accepting as complete the theory of tuberculosis as at present stated.

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* "A Preliminary Note of some Experiments on the Etiology of Tuberculosis," by Dawson Williams, M.D., *Trans. Path. Soc. Lond.*, vol. xxxv. 1884.

For, admitting that the virus is capable of transmission from the diseased to the healthy, it is no less certain that the conditions under which such transmission is possible are limited, that the virus is one with which the natural force of the healthy organism is not ill-fitted to cope, and that in consequence the activity of the contagion is a low one. The tendency of the day is setting surely towards the adoption of extreme views of the infective power of tubercle; but it is clear that one contagion and another differ widely in their power of propagation, and it is our business not to deal with all alike, in ignorance of this fact, but to find out the limits of the range of action of each.

In considering the mode of infection the age incidence of tuberculosis has also to be considered, and if one may judge from fatal cases where the diagnosis was verified by *post-mortem* examination it would seem that infants are in a marked degree subject to tuberculous infection. The chart on the next page may emphasise this point.

It will be seen that the mortality from tuberculosis is much heavier during the first five years of life than in later childhood. The chart shows also the gradual increase of the liability to tuberculosis during the earlier months of infancy, only one case in this series of five hundred cases occurred below the age of three months (at ten weeks).

Of recent years there has been a tendency to conclude, perhaps somewhat hastily, that milk infection is chiefly responsible for the heavy mortality from tuberculosis in infancy: the occasional—perhaps more than occasional—presence of the tubercle bacillus in cow's milk has been abundantly demonstrated (*see* p. 62); the period of infancy is the period of milk-feeding, *ergo* infants are infected by the milk with which they are fed.

Plausible as such a theory may appear, more evidence is required before it can be regarded as proven; indeed, the facts of the *post-mortem* room are strongly opposed to it, and it seems almost certain that infection in infancy far more often enters by the respiratory tract.

Our own statistics showed that in 216 children under the age of twelve years, who were examined *post-mortem* at the Children's Hospital, Great Ormond Street, and in whom it was possible to determine the channel of infection with some degree of probability, 138, that is, 63·8 per cent., appeared to have been infected through the respiratory tract; whilst only 63, that is, 29·1 per cent., showed evidence of primary infection through the intestine. If only infants are considered the proportion of cases showing primary intestinal infection instead of becoming greater actually becomes less; of 100 infants (up to two years of age) 65 showed evidence of infection through the lungs, 22 of infection through the intestine. These figures agree

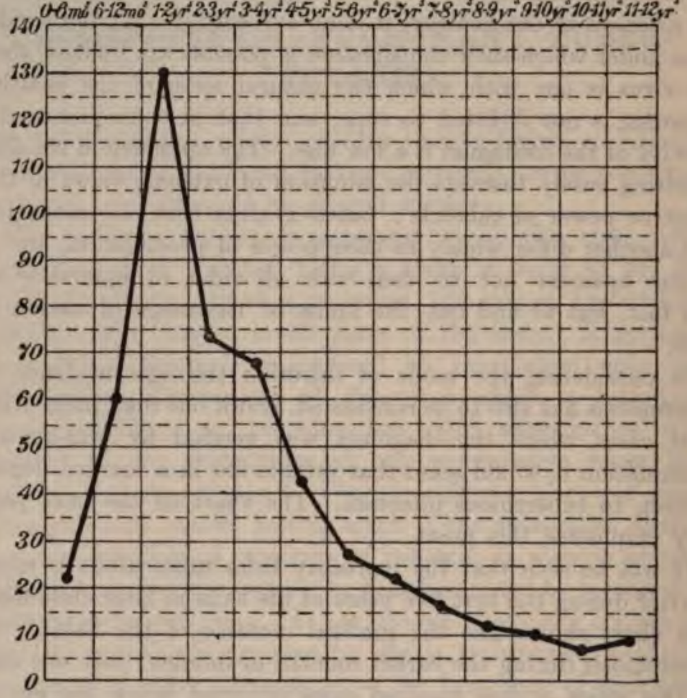

Chart showing age-distribution in 500 consecutive cases of tuberculosis in children.*

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* "Tuberculosis in Childhood," *Practitioner*, July 1901.

closely with those obtained by other observers, and would seem to show that the commonest mode of infection with tubercle in childhood, and especially in infancy, is by inhalation. At the same time the proportion of cases showing evidence of primary infection through the alimentary tract is quite sufficient to justify the most stringent precautions against the possibility of milk—or meat-infection. A striking feature of tuberculosis in childhood is its tendency to rapid generalisation, and, therefore, as might be expected, the outlook is even more grave than in adults; the commonest form of tuberculosis in the child, as in the adult, is pulmonary tuberculosis; we found it in 210 out of 260 cases, that is, in 78 per cent., but in the child the lung disease, if not at the outset part of a more general infection, very quickly becomes so. One of the most disastrous results of the tendency to generalisation is affection of the meninges, which is the actual cause of death in nearly half the cases of tuberculosis in childhood; tubercular meningitis was present in 114 out of 238 tubercular children, that is, 48·3 per cent.

Affection of the lymphatic glands plays a much more prominent part in the tuberculosis of childhood than in that of later life: how the tubercle bacillus reaches the glands it is often impossible to determine, but of this there can be no doubt that a softening caseous gland is often a focus from which a more general infection occurs; the glands in the neck, those in the mediastinum, or those in the abdomen, may be the starting-point of a generalised tuberculosis in any particular case. In 254 tubercular children at the Children's Hospital, Great Ormond Street, in which the condition of the glands was noted, 209, that is, 81 per cent., showed caseation of the mediastinal, and 151, that is, 59 per cent., caseation of the mesenteric glands.

Pulmonary Tuberculosis.—Tubercular affections of the lung in children resemble those in the adult, in so far as the presence of grey tubercle and cheesy softening in various stages are common to both. But in children the pattern or distribution of the disease in the lung is less uniform. If we exclude doubtful cases of early apical disease in children, it is certainly not common to meet with changes which have excavated the lung from above downwards, as is seen so constantly in adults. Any one with large experience amongst children will no doubt meet with such not so very infrequently, but other cases are more common, in which there is no cavitation, or the lung is attacked less regularly. These appearances will be described directly under their morbid anatomy, but here it may be said that such differences as exist largely depend upon the physiological standard of growth which obtains in infancy and childhood. For example, in malignant tumours at this period—whether they be of testis, or kidney, or liver, or what not—we do not expect to find a slowly growing disease, such as is ofttimes found in adults. The processes are active, and the growth, whatever it be, rapid. And so it is with tubercle. It runs its course more rapidly; and thus we have more often to do with miliary tuberculosis, with solidification by grey tubercle, with grey tubercle softening into yellow after a miliary pattern, and but seldom with any large cavities. In the same way, the fibrous forms of disease are less frequent, and other forms develop by reason of the proneness in infancy to excess of activity and to degenerative changes in the lymphatic glands.

The **tubercular** appearance is generally made much of in pulmonary tuberculosis in children; and we are all familiar, no doubt, with the description of the pretty child, with its well-formed skeleton, its soft hair, long eyelashes, peachlike skin, good nails and teeth, and intelligent mien—and with its antitype of coarseness, the pale, sallow, stunted, thick-skinned child, who goes the same way, albeit, perhaps, by a modified route of scrofulous glands. These types have sprung out of experience, and should be well remembered. But the student's difficulty will be that he is unable to push these definitions sufficiently to be of use to him, and as soon as he seeks to be enlightened, not upon the tubercular appearance, but upon the distinctions between it and others—particularly that which is called by some the "rheumatic conformation"—so that he may be able to say this is one thing, that certainly another, he finds his teacher fail him. Types of this kind will not bear too close a scrutiny—it would puzzle any one to distinguish many a rheumatic child from a tubercular one; knowledge of this kind is a personalty which is not easily shared, but which is nevertheless real property.

The shape of the chest in tubercular subjects has been alluded to by most writers, and Hillier, who is too good an observer to be ignored, describes three typical forms:—(1) the long circular chest; (2) the long chest, with narrow antero-posterior diameter; (3) the long, pigeon-breasted chest. I cannot say that I am sure of these; it has seemed to me that a rachitic chest is too frequently the cause of collapse, and of subsequent cheesy and tubercular changes to make the distinctions of great value. Tubercular chests are small chests with the apices contracted or flattened.

The **symptoms** of pulmonary tuberculosis in children are often most obscure. In the early stages they are those which the one shares in common with other diseases, and notably with that condition to which Dr. Eustace Smith has given the name of "mucous disease." The child is pale, thin, capricious in appetite, and has a dry cough; the bowels are irregular, perhaps there may even be worms. All these are conditions which are often neglected as temporary derangements. The temperature is not taken at night, and possibly a case thought to be mucous disease develops acute tuberculosis and the child dies rapidly, whilst one as to which suspicions of pulmonary tuberculosis are entertained gets well. This uncertainty is in great measure due to the ambiguity which attaches to the physical signs. It takes several very careful and complete examinations to be sure of an early tuberculosis, and even then it is sometimes impossible to avoid mistakes. We may all find, if we look back upon our notes of earlier years, that a large majority of the cases which raised the question of pulmonary tuberculosis have subsequently solved it by the restored health of the children. In looking over my own notes, I find that no less than 152 out of a total of 233 must be considered doubtful. There was dulness at one or other apex, some clicking crepitation, deficient movement, or bronchial breathing, but which has never come to anything, and in most of which what seemed certain at one examination was very uncertain subsequently. One passes through phases of experience; at first all cases are tubercular; a riper knowledge shows advanced pulmonary tuberculosis to be comparatively rare. Of the 233 cases mentioned, 64 were pronounced; 17 others were cases of acute tuberculosis.

No age is exempt from acute tuberculosis. Congenital tuberculosis, although an extreme rarity, has now been recorded several times, and in infants only a few weeks old one or other apex will sometimes become suddenly dull, and the child die with the lungs studded with tubercle within a short time. Nevertheless, it does not become common until the period of dentition is reached, and then it is that a disseminated form of tubercle, associated with cheesy bronchial glands, is so frequently found.

Morbid Anatomy.—All forms of tubercle, or rather tubercular inflammation, are met with in the lungs of children, and they are all more or less found together; but for practical purposes, I think we may distinguish four groups of cases—viz. (1) those in which the disease is chiefly, often entirely, a miliary tuberculosis; (2) those in which there is a conglomerate form of grey and softening tubercle—perhaps yellow and grey infiltration—and cheesy bronchial glands; (3) a more chronic form, with cavitation and fibrous changes; and (4) cheesy solidification. It is difficult to obtain figures to tell the relative frequency of these groups. The conglomerate form has been the commonest in my experience, miliary tuberculosis next so, and the others far behind. Some authors describe still further a fibroid form of phthisis. I have once met with a peculiar fibroid form of phthisis without tubercle, in a boy of thirteen, who came under the care of Dr. Pye-Smith, and the case is recorded by him in the *Transactions of the Pathological Society of London*, vol. xxxiii. The appearances in the lung and liver, which was cirrhosed, were to my mind very suggestive of old syphilis. But Sir Thomas Barlow has met with more than one very similar case, and without any history of syphilis; and no doubt cases of this kind occasionally happen, the cause of which is obscure. There is, however, a more common condition, which I have already described, where the base of the lung is solid and the bronchial tubes dilated; but this is certainly most commonly due to some bygone pneumonia or pleuritic effusion.

There is no need to go minutely into the morbid appearance of the lungs in the several classes of cases, as the minute changes do not differ from tubercle, as seen in adults, but one or two peculiarities may be mentioned. In the first place, the individual granules of miliary tubercle vary much in size, and are sometimes so minute as to escape detection upon superficial examination. This is particularly the case where death has come about rather rapidly by tubercular meningitis, and it may serve to impress attention upon the fact that the lungs may be perfectly free from any pneumonic changes, and consequently that miliary tubercle of this kind is beyond detection by physical examination during life. Its presence can then, indeed, only be suspected by the existence of bronchitis, in association with other conditions which make for the existence of tubercle, unless, as is possible, the choroid should be affected (*see* chap. xxxv.).

Next, it should be noticed that the distribution of tubercular disease is more irregular in the lungs of children. It is more common to find it distributed throughout the lung than at the apex and from thence downwards, and it is also very common to be able to trace a rough localisation of the disease about the root of the lung, whilst there is certainly less evidence of the extension by continuity of tissue, which is so common in adults, though perhaps more of clustering around and extension along the bronchial tubes and septa. Again, the existence of cheesy bronchial glands of considerable size and fleshiness is far more common in children than in adults; indeed it is quite the exception to find tubercle in the lungs in children without more or less extensive caseation of the mediastinal glands; and last, but not least, there is an allied disease which I have met with several times in children—never, so far as I remember, in adults—and to which I would give the name of **cheesy consolidation** of the lung. The most remarkable example of this affection that I have seen was in a child of two years under Dr. Moxon's care at Guy's Hospital. The whole of the left side of the chest was dull, and there had been a question of the existence or not of pleuritic effusion. At the post-mortem examination, nearly the whole of this lung was converted into a solid, firm, cheesy, mass, quite like an enlarged and cheesy bronchial gland which has undergone no softening. Towards the front of the lung a little spongy tissue remained, which was studded rather thickly with yellow tubercles, whilst the other lung was crowded with tubercles. A precisely similar case has been recorded in the *Transactions of the Pathological Society of London*, vol. xxxvi., by Dr. Hobson and the late Dr. Lanchester. The specimen was submitted to Dr. Payne and Dr. Coupland for a report and they considered the disease to be a peculiar form of pneumonia. I have seen less extensive disease of the same kind several times, in which a part only of one lobe or the middle lobe of the right lung has been diseased, and it has some times seemed to be due to a gradual growth into the lung from the cheesy bronchial glands at its root.

It need hardly be insisted how these points in the morbid anatomy are corroborated by, and in their turn enlighten and emphasise, the physical signs of pulmonary tuberculosis. They show why it is that the physical signs are so often obscure, for, if the disease begins by preference at the root of the lung, it will long be covered by vesicular structure, and the more distinctive features will want that constancy which will alone allow of precision in diagnosis. They will show, too, how carefully the chest must be examined, inch by inch, so that the small patches of disseminated softening so often found at autopsy may not escape detection; how, with the enlargement of the bronchial glands in the posterior mediastinum and the extension of disease from them, the intervertebral grooves must be carefully examined by percussion and auscultation, and the resulting sounds most carefully weighed with our experience of those of health.

I have already alluded to a child as regards the nature of whose ailment great uncertainty existed for three weeks whether his disease was typhoid fever or tuberculosis, but which turned out to be the latter. The physical signs of disease at the root were not of the most distinct, but they were there, and, looking back upon the case, it seems probable that, with a suspiciously wandering dry pleuritic rub and slight intolerance of light, they were not insufficient to have determined the diagnosis had their value been rather more judicially examined. These cases frequently require all one's powers of mind, a rigorous examination, and the most impartial analysis of symptoms, to enable one to arrive at a right conclusion.

Another point in the morbid anatomy of pulmonary tuberculosis is, perhaps, worth mentioning, as it throws some light on clinical symptoms; namely, the not very rare occurrence of associated changes in the lung which may be indirectly due to the tuberculosis, but are not in themselves tubercular. In this way more or less extensive simple broncho-pneumonia sometimes accompanies tubercular change. Severe exacerbations of clinical symptoms and physical signs may thus occur, and give rise to fears of acute dissemination of tubercle in children with pulmonary tuberculosis, but the fresh signs and symptoms subside, leaving the original lesion little, if at all, altered; and it would seem that in these cases simple broncho-pneumonia supervenes in a tubercular lung. A more serious complication, which we have sometimes found post-mortem, is an acute necrotic change about a tubercular focus, generally, perhaps, where tubercular cavitation has occurred.

The other viscera should always be examined in questionable pulmonary tuberculosis; it may be that an enlargement of the liver or spleen may be detected, possibly some early tubercular disease of the choroid. (Refer to Tubercular Meningitis, chap. xxxv., for illustrations.)

Attention should also be paid to the lymphatic glands in the neck and elsewhere; enlargement or caseation of these may give early information of tubercular tendencies. Such cases as follow are quite common.

A female child, aged seventeen months: The lungs were studded with recent tubercular pneumonia, but in addition there was much caseous enlargement of the bronchial glands, numerous tubercles in the liver and spleen, general cheesy change in the mesenteric glands and tubercular ulceration of the intestines

A boy, aged one year: The lungs were stuffed with grey tubercle in a state of early caseation, the bronchial glands were much enlarged, and there were tubercles in the liver, spleen, and kidneys.

Complications.—Death occurs in most cases amongst younger children through the outbreak of a general or acute tuberculosis, and the extension of the disease to the brain and its membranes. Thus we may find tubercular meningitis, yellow tubercle in the cerebellum or other parts; as well as tubercle of the organs already mentioned, of the peritoneum, and elsewhere. In older children, where the disease becomes very chronic, the same results are met with as in adults—viz., lardaceous disease of the viscera, fatty liver, tabes, and intestinal or laryngeal ulceration.

Diagnosis.—In any case of apical disease caution is necessary in coming to a conclusion. Over and over again the physical signs which denote consolidation pass away. Acute pneumonia running a rather more chronic course than we think it should do, arouses our fears only to dispel them. Pleuritic effusion may give rise to rather persistent tubular breathing at the apex. This, again, clears up, if we only give it time, and it is my distinct belief that there is many a local disease at the apex, both parenchymatous and pleuritic, which arouses exaggerated fears only by its position. Localised pleuritic effusions both serous and purulent, may take place below the clavicle as well as at the base, and if there be any doubt upon the point, this part, as well as the base, should be explored by the hypodermic syringe. It is, indeed, hardly possible to insist too strongly upon the necessity of always being on the watch for the presence of fluid, and particularly of pus. Empyema is so common in children, and so frequently puts on many of the appearances of tuberculosis, that mistakes are quite common. The case should be examined repeatedly if there be any doubt, the temperature taken regularly, and the body weight at sufficient intervals. After whooping-cough, too, the physical signs are most puzzling. There are plenty of coarse mucous râles and patches of tubular breathing down the front of the lungs and round the nipples, which, with the excessive wasting, make one apprehensive. Nevertheless, we must not be too hurried in coming to a positive conclusion.

The reverse error, namely, to mistake pulmonary tuberculosis for pleural effusion, is particularly likely to happen in the cases of extensive caseation involving the whole or part of one lung. In these cases the physical signs may be almost identical with those of effusion ; there is the deficient movement, the absolute dulness, the marked increase of resistance, the diminution or even absence of breath sounds and vocal resonance, and also of tactile vocal fremitus. Exploration may be the only possible method of diagnosis in such cases, and even this may be misleading, for it sometimes happens that the needle enters the lung and withdraws a drop of purulent secretion from some bronchial tube, or some superficial cavity.

Prognosis.—Pulmonary tuberculosis is in most cases capable of improvement, says Gerhardt ; and there can be no doubt as I have said, that many cases, too hastily condemned as cases of consumption, improve and soon get quite well. The frequency with which scars, relics of various kinds, calcareous and other, are met with in the lungs of older people, prove conclusively that many of the changes which constitute pulmonary tuberculosis are reparable if not too extensive. But perhaps the most irrefragable evidence of the possibility of repair of tubercle has been offered since the peritoneum has been dealt with by the greater boldness and success of latter-day surgery. Cases are on record where tubercular granulations have been seen upon the peritoneum during operations, and the patient has subsequently recovered, and this fact has been utilised within the last few years by Kilner Clarke, Lawford Knaggs, and others for the treatment and cure of some of these cases by operation (*Trans. Clin. Soc. Lond.*, vol. xxi., 1888). But there is other evidence, hardly less strong. Some years ago I made an inspection of the body of a lady past middle age under Dr. Habershon's care, who died of tubercular meningitis. When a girl, she had been supposed to suffer from tubercular peritonitis, and we found, in accordance with that view, that the intestines were all matted together by old adhesions, and the greater part of the mesenteric glands converted into chalky concretions. The finding calcareous glands in the abdomen is no uncommon experience to those engaged in making frequent necropsies. Therefore it may be accepted as certain that tubercular disease is sometimes amenable to treatment. At the same time, it is to be remembered that these cases may ameliorate for a time, and then suddenly develop acute meningitis or general tuberculosis; and that if they do not show any tendency to improvement, the course of the disease in children is habitually shorter than it is in adults.

Treatment.—The essentials of treatment are good feeding and good air. The first presents difficulties in all walks of life; the latter chiefly for those to whom money is an object of concern. The appetite is generally capricious, vomiting is often troublesome, and these patients cannot take fats. They do well upon a rich diet, if it can be borne, and they should be encouraged to take plenty of good milk, cream, suet and milk, and eggs. Plain beef or mutton, nicely cooked, are the most nourishing, but in many cases fish, oysters, soups, &c., are requisite to vary the diet and tempt the appetite. Small quantities of stimulant are of unquestionable value. It may be given as stout, or bitter ale, or wine with food. In sucklings, if there be any delicacy about the mother, the child should either be fed artificially or supplied with a wet-nurse. The air of large towns is hurtful, and children with any suspicion of phthisis should, if possible, be removed to a dry seaside place, and be much out in the open air. Every possible attention must be paid to the general health, and the rooms in which the child lives and sleeps must be well ventilated. Damp is reputed to be injurious, whether associated with warmth or cold. Cold and damp combined are certainly prejudicial, and there is also a tendency in these cases to keep fairly well through a winter, and then suddenly to deteriorate as the showery warm weather at the spring comes in. Cold, if dry, is often most serviceable for early cases. The soil should be dry, and the place protected from the colder winds of N. and N.E. The clothes must be warm. Of drugs, cod-liver oil, by common consent, is of great service, and what with tasteless, almondised oil, biscuits in which the taste of the oil is almost concealed, and capsules, a great many children, with whom there was difficulty, can now take it comfortably. It may be given in water, orange wine, milk, or coffee ; indeed, in any way that may suggest itself, and the dose is to be increased from half a teaspoonful up to two or more (F. 17). When the oil is taken badly, some of the mixtures of maltine and oil may be taken well, and of emulsions Corbyn's is, I think, the best. The taste of the oil in this preparation is hardly recognisable. Such children are often very anæmic, and arsenic is therefore very useful. It may be given in three to six-minim doses, with some simple syrup, or with benzoate of soda, syrup, and water (F. 44). Many other remedies have been recommended which it would be impossible to mention. The most useful is, I think, the chloride of calcium—which should be given in doses of five to ten grains in some extract of liquorice, glycerine and water, three times a day for a long period. Dr. Sturges speaks well of the hypophosphite of soda given in doses of ten to twenty grains three times a day. I have latterly tried iodoform, on germicide principles. It must be given cautiously, in half-grain or one-grain doses up to two grains, with white sugar, in a powder. Some children take it very well, others badly; some it makes sick, delirious, and ill. Of unquestionable use sometimes in adults, it has seldom appeared to me to be beneficial in childhood.

Counter-irritation may be produced by a mustard-leaf or some linimentum iodi, but in all cases it is to be remembered that a child's skin is very tender and easily vesicates.

For the cough, some simple expectorant may be given, and when there is much night perspiration, belladonna is by far the most reliable remedy. Six to twelve drops may be given to a child of four or five years at bedtime, or a smaller dose may be added to each dose of any compatible medicine that may be taken during the day. Strychnine is also useful in this complaint, and sometimes the oxide of zinc.

I have once seen fatal hæmoptysis in a child of four and a half years from an aneurism on a branch of the pulmonary artery in the wall of a cavity. Other cases are on record, even in infants of a few months old, but hæmoptysis is not common. Should it occur, small doses of turpentine—*e.g.*, five or six drops of the oil—may be given with some mucilage of tragacanth, syrup, and dill water. Tincture of hamamelis, in five-minim doses, is also, I think, valuable, and is easily administered.

CHAPTER XXVI.

PLEURISY.

Pleurisy is a very common disease, and a particularly important one, if for no other reason than this—that the fluid effused is so frequently purulent. Of 149 cases under my own observation seventy-one were simple, seventy-eight purulent. This can, perhaps, hardly be considered a fair average, for a hospital physician is naturally likely to see the worst side of all diseases, and therefore more of empyema than of simple pleurisy.

The subjoined facts may be of interest:

Age.	Simple.	Purulent.
Under 1	6	4
Between 1 and 2	15	13
" 2 " 3	11	9
" 3 " 4	7	13
" 4 " 5	6	10
" 5 " 6	6	12
" 6 " 7	6	4
" 7 " 8	2	5
" 8 " 9	1	2
" 9 " 10	3	3
" 10 " 12	4	3
Not stated	4	0
	71	78

SEX.

Simple pleurisy occurred 31 times in females.
" " " 40 " males.
Empyema " 35 " females.
" " 43 " males.

Simple pleurisy affected the right side 28, the left side 43 times; empyema, the right 18, the left 59 times; one case is doubtful.

The large preponderance of left-sided empyema, over right-sided, four to one, is worth remembering.

Pleurisy is stated to be most commonly dependent upon disease elsewhere, and if we consider how many causes lurk in the various affections of the surrounding structures, we shall not wonder that it, at any rate, not unfrequently spreads from those parts. Tubercular disease of the lung; acute and chronic pneumonia; bronchitis; dilated bronchial tubes; disease of the bronchial glands; pericarditis; inflammatory conditions below the diaphragm, such as localised abscesses between the liver and diaphragm, or the spleen and diaphragm; general peritonitis; disease of the spine and ribs—these are some of the many affections which may set up pleurisy. Less obvious in their action, but frequent in predisposing thereto, must be reckoned scarlatina and rheumatism—the latter of acute fibrinous pleurisy, the former of empyema. The importance of both these affections as originators of pleurisy is, I believe, not fully estimated; but when all is said with reference to this matter, there will remain a large number, in my experience the greater number, in which it has not been possible to assign any cause, and I should therefore be disposed to think that idiopathic pleurisy is not so very uncommon.

Pleurisy may lead to the formation either of lymph, or serum, or pus. It is impossible to make any certain distinction clinically between those cases in which the exudation is fibrinous and those in which it is serous, or, to put it in other words, between those in which there is effusion and those in which there is none, the reason being, that in children the formation of lymph is so active that the presence of fluid is often suspected where the exploring syringe shows the opinion to have been unfounded. In the treatment of empyema, a knowledge of the existence of this excess of lymph is of the greatest importance.

Of recent years much work has been done on the bacteriology of pleural effusion.

Our own observations at the Hospital for Sick Children, Great Ormond Street, seem to show that the vast majority of empyemata are due to the pneumococcus which is found in the pus, usually in pure growth. Thus in 15 consecutive cases the pneumococcus was found in fourteen, the streptococcus pyogenes in one. A small number are due to the staphylococcus, and some, especially those with offensive smell, to a mixed infection.

Empyema in children is rarely associated with pulmonary tuberculosis, and even then is probably due in most cases not to the tubercle bacillus but to other organisms which find an easy entrance through the softening lung.

The bacteriology of serous effusions is a less simple matter; one can only say that in many of the cases of serous pleurisy there is reason to believe that the tubercle bacillus is the exciting cause.

Symptoms.—As a rule they are not very acute, even in simple (non-purulent) pleurisy, although there is a definite onset. Pain in the side is common, but it often needs to be inquired for. Fever, wasting, want of appetite, languor, and cough are the more usual symptoms complained of. Headache, vomiting, convulsions, and diarrhœa are occasional. The time at which the child has been brought for treatment has been very variable, from two or three days to as many months. This will serve to show that the acuteness of onset is liable to vary considerably; but I would say that occasionally it is so acute as almost to deserve the name of violent—the fever being high, delirium considerable, and the pain in the side apparently an agony. These cases are quite likely to be mistaken for an acute pneumonia, of which, indeed, it would be impossible to deny the existence in some measure, and they are, in my experience, very likely to be quickly followed by the rapid and copious effusion of pus. The temperature in pleurisy is of no characteristic type—it is often up to 101°, 102°, or 103°, in the afternoon or evening for the first day or two (in the very acute cases higher), and the pyrexia may be prolonged. I have several times entertained unfounded fears for the formation of pus from this prolongation of the pyrexia. It is difficult to get any large number of cases in which the disease has been uncomplicated and watched from the commencement as regards this point. In eleven cases the temperature has averaged not much over 100° after the first onset, although occasionally, in several of these, making erratic excursions. I have known the pyrexia to persist many times for five or six weeks, and to give rise to fears first of empyema and then of tuberculosis, and to clear up after all without ill result.

In infants, pleurisy is apt to produce a pinched and collapsed condition, like peritonitis in the adult. It is often difficult to diagnose by auscultation, for in infants the respiration, naturally harsh, becomes often of a peculiar raucous quality, which very closely simulates the rubbing sound of an ordinary pleurisy. As an illustration of this difficulty of diagnosis and also of the early age at which an empyema may occur, we may quote a case that occurred to Dr. Mackintosh of Clapham. A baby, four weeks and four days old, not known to be ill previously, was found to be gasping for breath the night before its death. It went to sleep on its mother's arm and died. The left lung was found to be airless, and eight ounces, at least, of pus were present in the pleura.

When the pleurisy is purulent, excepting in the very acute cases already alluded to, the onset is still more indefinite than when the products are serous. In this respect, again, the pleura may be compared with the peritoneum, in which the fibrinous or plastic inflammations are very generally acute, painful, and not to be mistaken; the purulent inflammations are apt to be overlooked, by reason not so much of their lack of symptoms as of the vagueness of those which occur. Nevertheless, commencing, as the disease often does, in acute pneumonia and other evils, a sudden onset is noticed in many cases. In eight out of fifteen, the child was suddenly ill; in seven, the onset was indefinite after mumps, or scarlatina, or pertussis. Of general symptoms likely to be present in empyema, emaciation is often *rapid* and extreme. I once saw a child, a few months old wasted to the last degree, with a moderate quantity of fluid in the left chest. The wasting seemed to be too extreme for pleurisy alone, and nothing was done to remove the fluid. The child died the next day, and the post-mortem examination revealed nothing but an empyema. There may also be much pallor, and sometimes a puffy appearance of the face, such as to suggest Bright's disease. This latter symptom I believe to be sometimes a most valuable one as indicating the existence of fluid in the chest, and, in the absence of renal disease or pertussis, pleuritic effusion should be thought of. Moreover, it is a symptom which indicates a large effusion, and I have seen cases where, except for this sign, the auscultatory, and other phenomena were in favour of pneumonia. It is not confined to empyema; it may accompany any large pleuritic effusion.

Nor is the temperature in empyema to be trusted implicitly. As a rule, it rises by night; and I have noticed that the suppurative fever is apt to register with particular delicacy a reaccumulation when once the pus has been removed by operation. It is by no means uncommon to find oneself in considerable doubt as to the presence of pus in empyemas which have not been tampered with; but when once the pus has been evacuated, should it again reaccumulate, the thermometer will indicate the fact with the most sensitive accuracy. When there is much emaciation, and the disease is chronic, there may be no elevation at all. Sometimes, while on the whole normal, sudden jumps will be made at night; but, in this, empyema accords with serous effusions, which are liable to behave in the same manner. It may be said, again, that we must be cautious how, in pleuritic effusions, we conclude as to the purulent nature of the complaint from the evening rises of temperature, for these sometimes occur night after night for a considerable period in cases where no pus exists. Diarrhœa is a valuable sign of the existence of pus in the pleura, and the same remark applies to sweating.

There is one other negative sign to which it is well worth while to draw attention—viz., the absence of any indication of distress in breathing. Such a thing might otherwise be thought impossible with one or other side of the chest full of fluid. Yet not only may this be so, but even the heart may be considerably displaced without symptoms. This is noticed in the more chronic cases, and is not difficult to explain. A like phenomenon is present in many cases of phthisis, and it is dependent in great part upon the compensation which takes place as the disease progresses, the emaciated body requiring diminished action of the lung and thus aeration and the circulation are carried on.

Physical Signs.—There are several difficulties in the detection of fluid in a child's chest, which are far less perplexing in adults, and pleurisy in children requires therefore the greater care. It is frequently overlooked or misnamed. The presence of fluid in a child's chest is very often only established by the concurrence and correct appreciation and interpretation of several slight indications. It is therefore necessary to pay attention to slight deviations from the normal. A careful **inspection** tells us that one side is moving less well than the other; the lessened range of movement may be considerable—if so, so much the better for the diagnosis; the affected side is rather more flat, or appears generally contracted. In very chronic cases the spine may be bent towards the diseased side. This contraction of the chest may sometimes be verified by the cyrtometer, but exact measurements of the size and outline of the chest are difficult to make accurately and therefore very liable to lead to a wrong conclusion. Bulging of the ribs and intercostal spaces is said to be an indication of the existence of pus, but it is common to find the affected side natural, smaller, or distorted, rather than over-distended.

Percussion.—If the chest be full of fluid, there may be complete dulness all over the affected side, the heart will be more or less displaced (one of the most valuable of all signs of fluid in the chest), and the case will present no difficulties. But such cases are not common. Fewer mistakes will be made if, on the contrary, we look to find modified resonance only, not dulness, at the apex of the affected side. But comparing the one apex with the other, the resonance will not be the natural deep resonance, but a high-pitched tympanitic note. Whenever this quality of sound is present, the first thought should be—Is there fluid at the base of the chest?

Pleural effusion at the base is a common cause of tympanitic or altered resonance at the apex, in children. Occasionally it is due to pneumonia or to some consolidation at the apex itself. But should there be any dulness at the base, stronger evidence than usual is necessary to convince us that there is really any disease at the apex.

The tympanitic note at the apex is a physical sign which has attracted much attention, and the mode of its production has been often discussed; it is spoken of sometimes as the *bruit Skodique*, or Skoda's tympanitic resonance. It is usually attributed to a diminished volume of air in the lung or to diminished resilience of the chest-walls, but it is obvious that either condition may be produced in various ways, and the meaning of tympanitic resonance by itself would have to be decided upon the balance of probabilities.

Percussion should be gentle. The chest-walls are yielding, and it is easy in childhood to displace fluid and get upon spongy lung beneath, so as to elicit resonance where there should be dulness.

Here again we must be careful, in dealing with the chest of a child, how we apply the teaching which has been gleaned from adults. The auscultatory phenomena of fluid in the chest are—absence of the respiratory murmur; absence of the vocal resonance; absence of tactile vibration; and, if the compressed lung be near the surface, high-pitched distant tubular breathing will be heard. If all the signs are present, the case presents no difficulty; but such, again, are exceptional cases in childhood. What is usually heard may be illustrated by a reference to the two most common mistakes which are made by students. I am generally told that there is bronchial breathing upon the *healthy* side, or else at the apex of the diseased side. It is quite common to hear all over the affected side a soft vesicular murmur of good quality, but *deficient* in quantity. If there were only the one side to judge from, the difficulty would be extreme to say whether disease were there or not, but, on auscultating the unaffected side, the exaggeration of the inspiratory murmur excites attention—there is apparent the so-called puerile breathing; but since " puerile," is applied to adults as compared with children, when comparing the normal child-respiration with the abnormal the latter must be called " exaggerated puerile." The inspiratory murmur is very hoarse and harsh, and the expiratory is also rather longer than it should be; but if we gauge the length of inspiration and expiration, the latter is not out of proper proportion.

Again, on the diseased side, I am perhaps told, that there is bronchial breathing at the apex, and the case is called phthisis. Here the observation is correct; the inference from it is wrong. There is often bronchial or tubular breathing beneath the clavicle on the same side as the effusion, and this is only what might be expected. The lung is more or less compressed by fluid, and therefore prevented from expanding; hence the more or less bronchial, nay, even sometimes loudly tubular, respiration, just as there is the tympanitic resonance. Again, we have to judge not by the single sign, but by several combined. The tympanitic resonance at the apex first puts us on guard; then, by careful percussion, comparative dulness at the same base is detected, and on auscultation bronchial respiration, or a soft, distant, vesicular murmur, with a diminution of the voice sounds. The latter is often interpreted by the student as bronchophony, on the other side. I take no note of tactile vibration, as in many children it is difficult to make out anything positive about this, the voice giving but feeble vibrations on either side. We shall often obtain no more pronounced physical signs than these, and with them we must be content. Good though deficient vesicular murmur may be present all over the side which is full of fluid, and unless this is remembered there is likely to be a mistake in diagnosis.

But if we have an opportunity of examining a patient day by day, another phenomenon will probably puzzle us, and that is the variability of the signs; an examination one day reveals dulness and bronchial breathing; another day there is much less dulness, and what may be considered as good vesicular murmur; one day the chest looks bulging, another retracted; and these variations are apt to follow each other quickly. This is a feature of chest disease in children. The explanation is perhaps not easy to give. It may be, and I think it is, due to the difference of inspiratory power at various times.

The presence or absence of crackling or bubbling mucous râles in the chest. particularly at the apex, should be attended to. In the bronchial breathing of condensed lung from fluid in the chest, there is often for long an absence of sounds of this kind; and persistent absence of crepitation is one point, in children, in favour of the non-existence of phthisis, the disease which is most often mistaken for pleuritic effusion.

If death takes place from serous effusion, some tubercular or pneumonic affection is usually at the bottom of it. Some hold that a serous effusion is the origin of most of the empyemas, and base upon that belief an argument in favour of early paracentesis in the former. I think the balance of probability is against this view, and in favour of empyema commencing as such, except in occasional instances.

Morbid Anatomy.—Death from empyema takes place at different periods, and the condition of the pleural cavity will vary somewhat accordingly. The chest may be full of pus, or there may be, besides the pus, much thick caseous lymph, or the pleura may be loculated by bands of lymph. I have even seen serum in one cavity and pus in another. The lung may be bound down and quite airless throughout, or one part or another may be compressed by fluid.

In acute pleurisy in children there is often a remarkable amount of lymph. This is important, because its softening and degeneration may possibly in part explain the frequency of empyema. Moreover, in the treatment of these cases it may mislead by preventing fluid coming by the exploring syringe, and it frequently proves troublesome by blocking the opening of the incision made to evacuate the pus.

Histological examinations show sometimes simple compression of the lung; sometimes more or less inflammatory cell-growth, running along the septa of the lung from the pleura inward; sometimes nests of cells scattered through the bronchial septa, which suggest the possibility of the disease having originated in some pneumonic process.

Complications.—It is important that it should be realised that the complications of empyema are usually the result of a further pneumococcal infection, and it seems probable that in many cases the empyema is the source of the secondary infection. The commonest of these is pericarditis, usually slight in degree, the serum in the pericardial sac being a little turbid with flakes of lymph in it; sometimes, however, the pericardial sac contains pure pus with shaggy lymph adherent to the pericardium. We have occasionally seen inflammation of the connective tissues of the mediastinum in such cases, and sometimes a localised collection of pus here, but this is exceptional.

Suppurative meningitis of the brain and spinal cord is by no means an uncommon cause of death in empyema; it was found in five out of twenty-seven fatal cases at Great Ormond Street. In the same series of cases suppurative peritonitis occurred four times.

Suppurative arthritis and subcutaneous abscesses are also sometimes seen with empyema.

In some cases it is difficult to be sure that the infection of the pleura has preceded these conditions, but in some it certainly does, and the moral would seem to be that in all cases an empyema should be opened at the earliest possible opportunity, and that a free opening should be made; for the lymph is no less a possible source of infection than the pus, and indeed any of these complications may occur where there has only been a layer of shaggy lymph on the pleura without any actual pus, a fact which is explained by the finding of the pneumococcus in pure growth in the lymph in many of these cases.

Death in the later stages is due to exhaustion, tuberculosis, or lardaceous disease of the viscera, but the last named is fast becoming a disease of the past owing to improved methods of dealing with the disease.

It must further be added, that it is the belief of many that pleuritic effusion, particularly if purulent, is the origin of many of the cases of chronic pneumonia, fibroid phthisis, and dilated bronchial tubes, that are met with in later life, and probably this is so.

Diagnosis.—There are no useful distinctions, as regards physical signs, between pus and serum. The *purulent* nature of the collection may be surmised from the cause—if pneumonia, measles, or scarlatina, &c., are known to have preceded it, the presence of pus is not improbable. Attention should also be paid to the general symptoms, of which pallor, pyrexia, sweating, and diarrhœa are perhaps the most important. But I have seen several cases of simple serous effusion, in which the temperature has risen regularly every evening; other purulent cases, in which the temperature has been nearly normal, and pallor and sweating are by no means to be relied upon. The question can only be settled by puncture with an exploring syringe, an operation which rarely does any harm, and generally suffices to clear up our doubts. The chest must be carefully examined beforehand, and the needle passed in wherever it appears that there is fluid, whether this be at the base, as is most common, or in the axilla, or even at the apex. I have obtained fluid three times from beneath the clavicle when nothing came from other parts. The danger of wounding the lung is but slight; it seldom does any harm; or, at any rate, the risk is a mere nothing as compared with the importance of settling the question of the existence of pus.

Occasionally, however, we have known bad results to occur from exploration, and it is well to be aware of their occurrence. In one case it had wounded the heart, producing slight hæmorrhage into the pericardium; the heart in this case was displaced upwards and outwards by extensive collapse of the left lung which had simulated fluid; in another, exploration was followed immediately by signs of pneumo-thorax with increase of respiratory difficulty, which proved fatal; in others there has been hæmorrhage from the lung more or less severe, and we have more than once seen extensive surgical emphysema result.

In cases where pneumo-thorax has resulted from exploration, pleural adhesions have been found post mortem, or consolidation of the lung which prevented closure of the puncture made by the needle.

A caution may perhaps be added with referene to the conclusions drawn from exploration—viz., that it does not always follow that no fluid is in the chest because none comes out by the aspirator. There are several conditions which now and again militate against the flow of the fluid. The lymph within the chest may be abundant and thick, whilst the needle is liable to become choked, or to push the lymph before it, and thus may never enter the cavity. A good deal can, however, be learnt, even when no fluid comes, by the passage of the instrument, and its behaviour subsequently on gentle manipulation, whether it is in a cavity or not. The risk of failure is somewhat lessened by using an exploring syringe with a needle tube longer and of somewhat larger bore than those made for hypodermic purposes.

The syringe should always be carefully tested before use and care should be taken to push the needle in far enough.

It must be remembered, however, as already mentioned, that a few drops of pus in the syringe may come from the lung-substance and not from the pleura; the failure to withdraw more than two or three drops of pus may raise our suspicions, and a careful consideration of the microscopic characters of the fluid withdrawn may detect this fallacy.

It is worth while in every case to examine the fluid withdrawn; its bacteriological characters should be determined if possible, as treatment and prognosis are to some extent affected thereby, the existence of streptococci or pneumococci, for example, in the fluid would point to the probable necessity of incision: we have even known hydatid hooklets to be present in a supposed serous effusion.

The next most important diagnostic difficulty is to distinguish between phthisis and pleuritic effusion. The two are often mistaken, the pleurisy being called consumption; but in treating of symptoms, enough has already been said to enable a distinction to be drawn. Of other conditions, the chief are chronic consolidation of the base from pneumonia and collapse of the lung. These may perhaps be distinguished by the increase of voice sounds in place of diminution; but, as I have said, the vocal sounds and vibrations are of less value in children than in adults, and cannot be certainly relied upon. If not, it may be necessary to explore by the syringe in these cases also, before coming to any positive conclusion. It was in a case of this kind that one of the few mishaps we have met with, in the use of the exploring syringe, came about. Directly the needle was passed into the chest, the child coughed up, perhaps, two drachms of bright red blood. It came so quickly, indeed immediately, upon the introduction of the needle, that I feared some large branch of artery must have been punctured, but no further ill-results accrued, and no more blood came.

A condition which sometimes closely simulates a localised empyema is an abscess in the connective tissue outside the pleura, due to caries of a rib. We have more than once seen this closely simulate empyema in its localised dulness and deficient breath sounds. The tenderness over the rib, the early pointing which would be very unusual with so small a collection of pus in the pleura, and perhaps a history of injury, may clear up the diagnosis.

Prognosis.—Serous pleurisy is but seldom fatal *per se*; but the likelihood of some tubercular manifestation appearing in the lungs or elsewhere later must be borne in mind. Some think that it is liable to pass into an empyema if the serous effusion is copious, and not removed early; but while allowing this to be possible, we know little to support it, and, indeed, clinical facts all seem to us to prove that it is quite rare, unless one includes under the head of serous effusion those cases in which a turbid serum with flakes of lymph in it is present; these, however, are probably sero-pus from the beginning, and it is only at the very earliest stage for a few hours or perhaps a day or two that they remain as such, the fluid rapidly becoming ordinary pus; they must in fact be considered and treated as empyemata from the very beginning, and it is to be noted that they are identical in their bacteriology with empyema, whereas clear serum, as already mentioned, is quite different in this respect. As a rule, simple pleurisies clear up with great rapidity. The fluid in these cases is not often excessive. When there is excess of fluid it is more often than not already purulent.

The immediate prognosis in empyema is, however, more grave. Naturally, a chest full of pus must be a serious evil. If let alone, it tends to spoil the lung by chronic pressure and inflammation or by burrowing into the lung. If the pus should make its way externally, the chances are better; but best of all are its early recognition and evacuation. Of late years this treatment has been very successful. In a series of fifty cases that I can count, either under Dr. Frederick Taylor or myself (I have not in this summed up the half of my experience), forty-two have quite recovered, a sinus remained in three, and five died. Of these last, however, it is only fair to say that one had suppurative pericarditis as well as empyema; in another, the empyema was double; a third was due to a foreign body in the bronchus and septic pneumonia; the fourth had a huge collection, with an eighteen months' history; and the fifth was doing well, when it caught measles and died of broncho-pneumonia.

Treatment.—Fibrinous and serous pleurisy are best treated by opium in moderate doses, to relieve the pain and the cough; and salines, such as the nitrate and citrate of potash, or some effervescing saline, to act as diuretic and diaphoretic. In the acute stages, warm fomentations are in most request; but cold compresses are also useful, changed every few minutes. In older children, the side should be firmly strapped, and warmth or cold can be applied by means of compresses or the ice-pack, outside the strapping.

After the first few days, iodide of potassium, in one- or two-grain doses, may be given with, if the temperature be normal, some syrup of the iodide of iron, the bowels being kept gently open by some mild aperient. It sometimes happens that, although the general symptoms clear up rapidly, the dulness remains behind; but this is only to be expected when we consider the large amount of lymph which is sometimes found. It is best, under these circumstances, to apply counter-irritation externally by means of the liniment of iodine; but more is probably to be gained by exercise and plenty of fresh air, by which free expansion of the lungs is promoted. When the disease is acute and the effusion excessive, paracentesis may be advisable;

if so, it is, I think, better to draw off a moderate quantity than to aim at removing the whole. I generally stop when the patient begins to be troubled with cough. But I am no advocate for paracentesis merely because of the presence of fluid. There is evidence in abundance that serous effusions clear up rapidly by natural processes; there is evidence in abundance, also, that the simple presence of fluid is not likely in childhood to harm the lung if the amount is not large and its duration be kept within a moderate limit of three or four weeks, and provided that the fluid shows signs of gradual diminution. When the effusion takes place rapidly, when it is in great excess, with displacement of heart, pallor, and puffiness of the face—such are the symptoms which indicate the necessity for aspiration. So long as there is pyrexia, aspiration should, in my opinion, be avoided if possible; the chest almost invariably refills, and little good is done.

We have next to deal with the treatment of empyema, and we shall be the better prepared to consider the question in any individual case if we remember that the pleural cavity is one which has difficulties and dangers all its own. The mobility of the lung, the rigid nature of the thoracic wall, the nooks and crannies in which pus can form, all would seem to combine to make efficient treatment impossible. Yet it is remarkable—if only the one drawback of inefficient drainage can be combated, and the cavity kept free from sepsis—how successful it becomes. I have seen a pleural cavity six weeks after the evacuation of an empyema so perfectly obliterated by silky adhesions of connective tissue, that, without the knowledge, one could not have believed that any disease had existed of recent years.

There are other less brilliant results, no doubt, and not infrequent too, such as the persistence of a fistula and discharge, until the lung is spoiled, and the child dies exhausted with lardaceous viscera; but these are far less common now than formerly, and will probably be even yet further diminished in number as the frequency of empyema is more fully recognised and its presence detected early.

But now for the actual treatment. Having assured ourselves by exploration of the presence of pus, what is to be done? It may be removed in one of several ways:

(1) The chest may be aspirated. (2) It may be tapped by

trocar and cannula, drawing off as much fluid as may be necessary, or as much as is possible. (3) After tapping, an india-rubber tube may be passed through the cannula into the chest, and the latter being withdrawn, the tube remains as a syphon. (4) A simple incision between two ribs may be made. (5) Portion of a rib may be resected and the pleura incised. Each of these methods of removal has its advocates, and all are useful on occasion. But as a rule it may be said that that method is most satisfactory which provides the most efficient drainage.

The importance of free drainage and the danger of delay impress themselves perhaps more forcibly on the pathologist than on the clinician, for it happens so often in children who have died with empyema that the autopsy reveals some secondary infection, such as suppurative meningitis or suppurative pericarditis, which has been the actual cause of death.

The modern practice of drainage by resection of part of a rib has now become so general that it is very seldom any other method is used in children. It is said to be difficult, especially in infants and young children, to obtain satisfactory drainage by a simple incision in the narrow space between two ribs, and for this reason it is held to be usually wiser to remove a small portion, an inch or an inch and a half of one rib, and so obtain a free opening.

A free incision is made over one of the ribs—preferably posteriorly and as low as possible so that gravity may favour drainage; but if the collection of pus is small the exploring needle is the best guide as to where the pus is most easily reached and the incision may be in the front, side, or back of the chest; the periosteum is then divided in the line of the rib and reflected by a periosteal elevator, and the portion of rib laid bare is then cut out with bone-forceps. A very small opening is then made through the soft tissues into this pleural cavity, and by keeping the finger over this opening the rate of exit of the pus can be controlled; it is allowed to escape at first very gradually, and then more freely, and the opening is then enlarged so as to allow for the introduction of a drainage-tube. It is well to insert the finger and remove any masses of lymph that may be within reach. A freely perforated stout but soft red rubber drainage-tube, which has been well soaked in carbolic

(1 in 20), is then passed into the chest and secured in position, and the usual antiseptic dressings are placed over it. The dressings should be removed twice in the first twenty-four hours, and once daily for the first few days afterwards, and the drainage-tube in the chest is to be shortened at the end of five or six days, if it is longer than an inch or an inch and a half. This is enough to keep the external aperture patent, and the internal parts are no longer interfered with. If the discharge remain very slight, the tube can be removed altogether, the temperature being watched closely; so that, if after its removal any evening rise occur, it may be at once reinserted. It not infrequently happens that with early removal such as this it becomes necessary to reinsert the tube for a time, but this is a less evil than its prolonged use in every case. It is hardly necessary to add that strict antiseptic precautions must always be adhered to. Both during the operation and for the first day or two during the dressings every facility should be afforded for the escape of the masses of fibrinous coagulum so commonly present. This is best done by opening the aperture by forceps, while the drainage-tube is withdrawn, and extracting anything that may be within reach. Except in this way, the chest cavity is not to be meddled with; and all washing out—though, unfortunately, it must be resorted to occasionally if the cavity become, or is already foul—is, in my opinion, to be deprecated.

Washing out the pleura is as difficult of efficient accomplishment as washing out the bladder. In either case sepsis should be *prevented.* When once the cavity has become foul (which with modern antisepsis is extremely uncommon), there is small chance of restorative action by any such means. And, as a matter of fact, an empyema that is foul at the opening of it, usually quickly becomes sweet if drainage be free and the patient of good recuperative power. Moreover, irrigation is not without risk; it may lead to sudden death. A number of cases have of late years been placed on record in which a sudden comatose state culminating in death has come to patients during the process of irrigation of the pleura. The cause of such a calamity is obscure—by some it is considered to be embolic, by others to be due to some reflex nerve-storm from interference with the pneumogastric; but the facts are quite certain, and they must be the mainspring of our action or inaction. Next, the drainage-tube is to be dispensed with as soon as possible. Inefficient drainage is, no doubt, the cause of many a bad result, but it is equally true that many a case becomes intractable from the too prolonged use of drainage-tubes. After the pus has been removed, the auscultatory signs show conclusively in most cases that the compressed lung soon begins to do a considerable amount of work. Vesicular breathing may often be heard to within a very short distance of the aperture in the chest-walls; add to this some ascent of the diaphragm and some falling in of the chest-wall, which is generally quite a noticeable feature of such cases, and it is obvious that the cavity soon becomes much reduced in size. A probe or a considerable length of drainage-tube can no doubt be inserted, but this proves nothing as to the existence of any considerable cavity. The instruments make a passage for themselves in the as yet unconsolidated lymph.

The operation of resection is a very simple one and has little more risk than the simple incision, while it certainly allows of much easier drainage, and also—a point of some importance—allows of more thorough examination of the condition of the lung and pleural cavity.* This method is not, of course, meant to assist the falling in of the chest, on which it probably has no influence whatever.

Resection of a rib is not, however, always necessary, especially in older children, where there is more space between the ribs, and there are cases in which, owing to the bad condition of the child, such an operation may not be advisable. For such, a simple incision may be sufficient provided an opening can be made large enough to admit of a good-sized drainage-tube.

But in very delicate or exhausted children it may not always be expedient to open the chest thus. The incision is not a trifle, and it may seem better every now and then either to aspirate or to tap.

In localised empyemas and those of rapid onset it may sometimes be advisable or necessary from surrounding circumstances to aspirate the chest. Dr. Bowditch has had great success with simple aspiration; Sir Thomas Barlow has also recorded good results; and I myself have had five cases in which nothing more than aspiration was required. This plan will find its most frequent application in very young children, and where the pus is in very small quantity.

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* In giving thus fully the accepted teaching with regard to resection of the rib in empyema, I am still bold enough to have the conviction that in the majority of cases resection is quite unnecessary. Excellent results have been, and can be, obtained by simple incision.—J. F. G.

But there is another condition in which aspiration may be the best possible course to pursue, and that is where pus is present in large quantity and the chest is very full with considerable displacement of viscera. Under these circumstances aspiration is often a wise preliminary measure. The sudden evacuation of the fluid in such cases by incision may be followed by severe suffocative dyspnœa. Taking away a quantity of fluid somewhat suddenly must of necessity disturb the intra-thoracic circulation, which has in many cases become accommodated to the abnormal state, and a risk is run thereby of the occurrence of a sudden œdema of the sound lung, which has not so very rarely proved rapidly fatal. Therefore, in cases of extreme effusion, it may be advisable to make a preliminary aspiration before draining the chest thoroughly.

But while aspiration may be advised as a method of temporary relief, it must be remembered that it is a fatal mistake to aspirate in such cases time after time, as is sometimes done. To do this is to take the surest means of converting the sac into a chronic abscess, and to invite a permanent fistula and collapse of the lung.

In private practice it will often happen, from various circumstances, that the treatment has to be modified to suit those circumstances—in other words, we are not always able to act up to the most modern light as regards a surgical operation, and I have sometimes been compelled to advise tapping with a large trocar, leaving a simple tube in the opening thus made. This is not a plan that is to be recommended; but under strict antiseptic precautions, it may be completely successful. The old syphon plan alluded to above, though seldom applicable now, might still upon occasion be of use. It requires a soft india-rubber tube of some length, one end of which is passed into the chest, and the other lies in a vessel containing some antiseptic fluid, such as weak carbolic lotion. It is convenient to divide it in the centre, and connect the divided ends by a piece of glass tubing; in this way the perfect action of the syphon is readily gauged. This plan has no doubt some not unimportant advantages over some others; the operation is easy of performance;

it is not a very painful one; and, if all goes well, the pleura is kept sweet. But empyema in children is very liable to be accompanied by large flakes of lymph in the cavity, and the tube becomes blocked and has to be removed, so that incision or resection is much to be preferred where possible as giving a freer exit to such material.

In cases of long standing, where the lung fails to expand after the pus is removed, and the chest is unable to fall in sufficiently to obliterate the cavity, a troublesome sinus persists: the child continues in a miserable cachectic condition, and may eventually develop lardaceous disease. In some of these cases it has been necessary to resort to the excision of portions of several ribs, a proceeding which not only allows thorough drainage of the cavity, but also greatly assists the falling in of the chest-wall. But it is a severe operation; is attended with very considerable risk; and is not by any means always a success

It is not advisable to keep cases of empyema too long in bed; a week or ten days after the opening has been made the child may sit up, and even sit out in the open air if possible.

Last, and most important of all—unfortunately for hospital patients a treatment that cannot often be utilised—comes *Margate air*. Any seaside air is beneficial, but, weather and season permitting, I do not believe there is any corner of England so quickly restorative to children with empyema as that in which Margate and Broadstairs are situated; and personally, I set much store by a change of this kind after the first three or four weeks have passed.

This is, I believe, in short, the best that can be done for such cases. But we must bear in mind that the conditions are such as to present obstacles in many cases to successful treatment, and empyema must therefore always be liable to prove disappointing. If we have to deal with an abscess in most other parts, the pus can be entirely evacuated, and the walls of the cavity can be adapted to each other and kept in position. In the chest it is not so; we are dependent upon contraction of the chest-wall, ascent of the diaphragm, granulation from the pleura, shrinking of adhesions, and expansion of the lung; and it is hardly to be expected that repair conducted under such adverse circumstances should present no difficulties; we should the rather expect that the cavity is more likely to be diminished in some directions, obliterated in some, and cut up so irregularly as to render complete drainage a matter of great difficulty ; and such is too frequently the case. But, nevertheless, it can be said that, recognised early and treated properly, the management of empyema, from being one of the most disheartening, has become one of the most successful and gratifying of minor surgical operations.

CHAPTER XXVII.

ACUTE TUBERCULOSIS.

Acute Tuberculosis has of necessity been several times touched upon in connection with the various viscera which the disease more particularly affects; nevertheless, it is so distinct, and has so definite a clinical position, that a few words may be devoted to its more general bearings. It is confined to no age, but is particularly a disease of childhood.

It is supposed by many that whenever acute tuberculosis occurs there is some local focus or caseating centre from which the disease has become disseminated. And, no doubt, in many cases this is so; a cheesy cervical or bronchial gland, chronic otorrhœa, scrofulous disease of the kidney or Fallopian tubes—something of this kind exists somewhere, and from thence the disease infects the glands or lymphatic tissues, and thus spreads by continuity, or from gland to gland, and produces the infiltrations and nodular growths with which we are all but too familiar. But this is not always so; miliary tuberculosis is sometimes found where, even after the most careful search, no caseous centre can be discovered, and it is not improbable that in such cases it is a primary infective fever introduced from without from milk or other sources. It is a disease, however, which seems particularly prone to break out in cases of the kind mentioned; and chronic otorrhœa, with disease of the temporal bone, epiphysial and joint affections in young people, cheesy bronchial glands, and unhealthy inflammation of the genito-urinary tract, are some of its more common precursors or sources of origin. In these, probably, the bacillus, introduced from without, obtains a suitable ground for its cultivation, and from thence it finds opportunities for becoming generalised.

Symptoms.—In its earliest stages, it is one of the most insidious and most difficult to be sure of in the whole range of the diseases of childhood. General malaise, pallor, wasting, fatigue, want of appetite, irritability of temper, slight fever, these are the indefinite symptoms which herald its onset, as they do that of many other far less serious maladies. The symptoms are not uncommonly so slight as to be attributed to worms or some trivial ailment by the mother or nurse. To the medical man the appearance, perhaps, betokens more than this, but he is at a loss between acute tuberculosis and typhoid fever, or some debilitated state which tonics will restore. Often he can only wait and watch, uncertain until the progressive emaciation and fever, perhaps enlargement of the liver and spleen, or more likely some few indications of disease in the lungs, compel him to relinquish hope. Sometimes he has hardly come to any conclusion, when intolerance of light, drowsiness, squint, are noticed ; quickly followed by convulsions, coma, and death.

But in most cases, as the disease becomes fully developed, there is a characteristic grouping of symptoms. Hurried respiration and a cyanotic tinge of cheeks and lips, which the physical signs in the lungs seem altogether inadequate to explain : râles all over the chest, with a percussion note which is perhaps poor but not definitely dull ; these symptoms, together with the enlargement of the spleen and continuous pyrexia, like that of pneumonia or typhoid, are very characteristic of acute miliary tuberculosis.

Last, but not least, must be mentioned tubercle of the choroid, which is very constant in this form of tuberculosis, and indeed must be considered almost peculiar to it. It is extremely rare to meet with tubercle of the choroid in any other condition, whereas in this disease it is usually present. In eleven consecutive cases verified by autopsy at Great Ormond Street, we found tubercle of the choroid ten times. Optic neuritis is also frequent, but less so than tubercle of the choroid.

It is astonishing sometimes how much disease is found after death where there has been but little evidence during life. A boy of six years was admitted to the Evelina Hospital for slight jaundice. He had the appearance of being considerably emaciated ; his temperature was 99·6° ; his tongue red and dry, his lips over-red; he breathed peculiarly deeply, 32 per minute; there was undoubted loss of resonance below the right clavicle, and bronchial breathing was heard in the inter-scapular region behind. The pulmonary symptoms, however, were not marked, and by these alone the nature of the case must have been at best doubtful; but the spleen and liver were enlarged, and, with the jaundice, turned the scale decidedly in favour of acute tuberculosis, for the causes of jaundice are not many at this age. It, and the enlargement of the liver and spleen, with evidences of emaciation and disturbed respiration, suggested tubercular disease of the liver and general tuberculosis. Even now the opinion was not altogether an unwavering one, for the jaundice disappeared and the child improved and left his bed for a day or two. Then he had a relapse, and his temperature ran up to 104°, and he died seven weeks after admission. The most that his chest had revealed was a good deal of dry crackling, chiefly below the nipples and in the scapular region, and occasional moist sounds in other parts. Dulness also came and went in an irregular fashion. At the autopsy, however, the lungs were stuffed with tubercle, and the bronchial glands were caseous and softening. In the liver were many small nodules of bile-stained tubercle, such as have been ascribed to tuberculosis of the ducts. The spleen also contained many tubercles.

Morbid Anatomy.—This disease differs from other forms of tuberculosis in its much more general distribution and in the appearance of the tubercular deposits. These are usually miliary in size and grey or greyish-yellow in colour: structurally they differ in no way from tubercle in its early stage in any form of tuberculosis. The characteristic feature of acute miliary tuberculosis is the fact that when death occurs the tubercles are still in the early stage—discrete grey tubercles—and as such are present in almost every organ in the body. There is, however, some variation in their appearance, depending, no doubt, partly on the duration of the disease. Thus, in some cases the grey tubercles are so fine that they might be compared to grains of sand thickly scattered throughout the substance of the lung, while in others they are more comparable to millet seed, and in others again they are even slightly larger, and are already becoming yellow and form minute caseous foci which are tending to run together into larger masses.

It is not uncommon in this disease to find tubercles in the thyroid gland, in the pancreas and the endocardium—positions in which it is extremely rare to find tubercular deposits in other forms of tuberculosis. The meninges usually show grey tubercles even when there has been little or no evidence of cerebral disease during life; the choroid too, as already stated, usually shows grey tubercles.

The whole condition as seen post mortem strongly suggests a blood infection; there is, so to speak, a shower of tubercle, which is scattered by the blood stream all over the body.

Diagnosis.—As we have already said, this is often difficult or impossible; but inasmuch as it is a general disease, affecting all the viscera and serous membranes, some help may sometimes be gained by detecting a slight pleuritic rub here or there, or any evidence of consolidation about the roots of the lungs. Hyperæsthesia of the skin and muscular twitchings not uncommonly indicate tubercular formation in the spinal membranes, and any intolerance of light should be carefully considered. Tubercle in the choroid or changes in the fundus oculi would make things certain. It may be added, that a hard enlargement of the spleen may give occasional help, but we must remember that the enlarged spleen of typhoid fever is sometimes in childhood an unusually resistant one.

The diseases with which acute miliary tuberculosis is most likely to be confused are pneumonia and typhoid, inasmuch as these are the two other conditions *par excellence* in which continuous pyrexia occurs. From the former it is distinguished usually by the presence of râles all over the chest, the signs being rather those of bronchitis than of pneumonia, and perhaps by enlargement of the spleen; from typhoid it differs usually in the predominance of respiratory symptoms, although, as has been already stated, these are sometimes the prominent feature in typhoid, so that the diagnosis may be very difficult. A positive result with Widal's reaction on the one hand, or the presence of tubercle in the choroid on the other, may, however, settle the diagnosis.

Occasionally simple acute bronchitis and also the early stage of whooping-cough raise the question of acute tuberculosis, but in both these conditions the splenic enlargement is likely to be absent, and an ophthalmoscopic examination gives a negative result.

Prognosis.—It runs a somewhat variable course, from three to six weeks; but, so far as is known, is always fatal.

Treatment.—Of late years, one has indulged the hope that some drug might be found to arrest the growth of the nodules of tubercle; but iodide of potassium, quinine, perchloride of mercury, salicylic acid, iodoform, turpentine, creosote and guaiacol, &c. &c., have all been tried, and, as regards general tuberculosis at any rate, have been found wanting. There is no treatment up to the present date that can be said to be of any avail.

CHAPTER XXVIII.

SCROFULA—LYMPHADENOMA (HODGKIN'S DISEASE)—BRONCHIAL PHTHISIS.

Diseases of the Lymphatic Glands.—Under this heading come diseases of the mediastinal and abdominal glands, and other less-known conditions. The more common affections are: Caseous disease of the mediastinal glands, or bronchial phthisis; tabes mesenterica, or abdominal phthisis; caseation of the more superficial glands, or scrofula. So also the various fleshy or lympho-sarcomatous growths, general or local, infiltrating or not, as the case may be. Of this latter group, the complex of symptoms called "Hodgkin's disease," or lymphadenoma, forms a part.

I shall probably treat the subject most intelligibly if first, in a general way, I describe the different varieties of cases which come under notice before taking the local conditions seriatim.

Starting thus from the simplest form of lymphatic hyperplasia, and proceeding to the more complex, we may notice, first, the case of the child of six or eight years old, good-looking, or perhaps with the thick skin and irregular features supposed to denote scrofula, with chronic enlargement of the tonsils. The tonsils repeatedly inflame, and as often as they are examined they show cheesy secretion filling their follicles and exuding from them upon pressure. By-and-by the glands of the neck at the angle of the jaw begin to enlarge: in one case, to suppurate quickly and subside again; in another, to undergo a more slow process of hypertrophy, followed by caseation and slow ulceration, which produces the scarring of the neck so often seen; in another, to develop gradually into a huge localised tumour, with some caseation in parts, but in which the most noticeable feature is slow and continuous growth. In another class of cases, the week without improvement until they are ultimately lost sight of. One is not therefore surprised that, with the doctrines of local infection which have been advocated of late years with much persistency, attempts have been made to cut the knot of medical powerlessness by an appeal to surgical aid, and chronic and intractable enlargements of glands are now frequently removed by the knife. I think myself that if after persistent trial has been made of measures such as I have enumerated the glands do not subside, or if in the course of such treatment the skin shows the least indication of reddening, then the glands should be removed. A thorough scraping often has a good effect. But if it be necessary to open and scrape it is little more to remove the diseased parts altogether. Other means less severe are practised by many surgeons, and I may mention the local galvanic caustic suggested by my colleague, Mr. Golding Bird, as being at once ingenious and perhaps sometimes useful in hastening the softening down and discharge of these caseous masses. As between letting the glands alone and removing them at once the time has perhaps even yet hardly come for a decision. We doubt the advisability of removing extensive chains of glands; if they be solitary patience and sea-air will often lead to their resolution. There are few places more restorative than Margate, Broadstairs, or Ramsgate for these cases. If a gland or glands resist treatment and show any tendency to soften, then they should be removed. They are not likely then to resolve, and they had better be removed sooner than later, when the parts will have become matted and infiltrated.

Hodgkin's Disease: Lymphadenoma.—In this group of cases growth replaces inflammation. The commencement is much the same as in tubercular disease of glands, indeed often, perhaps usually, it is impossible to say in the early stage which condition is present. A local tumour of fleshy consistence slowly arises in the glands—most often in the neck, maybe in one axilla, more rarely in the groin. At first we think we have to do with the ordinary hyperplastic and caseating gland, and not unlikely some carious tooth may seem to start it; but it goes on increasing, until at last a huge growth is formed, which buries the structures of the neck and chokes the patient. Associated with the glandular enlargement in these cases there is generally some enlargement of the spleen, and more or less profound anæmia. I have seen several cases of this kind. I give a note of one, because it was carefully watched for some time by Dr. Clement Dukes of Rugby:

A girl of ten. She had always lived at Rugby, and about six months before I saw her she had had dropsy following scarlatina. The glands in the neck became swollen three or four months later, commencing on the left side. A lump in the right axilla was noticed about the same time. The swelling in the neck gradually increased until it formed a nodulated elastic swelling, which uniformly distended both sides. The pulse was very rapid, and there was a short systolic basic bruit, but no other disease was evident. The lungs, the mediastinum, the liver, spleen, and blood were all normal.

Dr. Dukes tried all manner of drugs, but without success, and the child died eighteen months to two years afterwards of characteristic Hodgkin's disease, with general enlargement of all the lymphatic glands, though with but slight enlargement of the spleen. The submaxillary enlargement was so great as to obstruct the breathing. She was much wasted, and extremely anæmic.

In another case of this kind, a girl of seven, a mass of glands had been removed from the neck twelve months before; but others still existed on both sides and in the left axilla. There was also some evidence of pressure on the right bronchus. The liver reached nearly to the umbilicus, and the spleen was large and firm. There was no excess of leucocytes in the blood.

Here then are local tumours which correspond with the local inflammation; but the result of local stimulation is very different from that seen in the tubercular case. It would seem then that, starting from a common condition, a simple enlargement of gland due to local irritation, two diverse results obtain: in the one case an inflammation of specific character; in the other the growth of a tumour. And in both cases the disease is liable to become generalised: in the case of the specific or tubercular gland by the extension of the tubercular and caseating growth to other glands; in that of the glandular growth by rapid enlargement all over the body. The spleen, liver, and kidneys, undergo characteristic changes, the fundus oculi exhibits a form of hæmorrhagic retinitis, the body wastes, the child becomes anæmic, there is hectic fever, simulating that from the formation of pus, and death results from epistaxis, bleeding from the gums, purpura, albuminuria, exhaustion, or some leukæmic form of pneumonia. But even this does not complete the chain of conditions. For just as the tubercular disease of the glands may infect the outlying parts and become a general tuberculosis, so the tumour process in the glands also occasionally oversteps its boundaries and spreads into other tissues. Dr. Frederick Taylor has published a case of this nature,* in a boy, aged twelve, who had leucocythæmia, hypertrophy of the spleen and lymphatic glands, and fleshy lymphadenomatous growths of the pleura, mediastinum, liver, kidneys, and epididymis. This child had a high temperature and purpura, and died with dropsy, scanty urine, laboured breathing, and ulcerated gums.

This case may serve to illustrate the difficulty which there is in drawing any sharp distinctions clinically between lymphatic leukæmia—*i.e.*, cases of leucocythæmia in which there is enlargement of glands, and the disease known as lymphadenoma.

Examination of the blood offers the greatest hope of distinguishing between the various conditions in which general enlargement of glands with or without enlargement of the spleen, is met with in childhood. According to Hutchison, in the rare cases in which tubercular disease affects many glands all over the body, there is almost invariably more or less increase of the polynuclear leucocytes, whereas in the so-called lymphatic leukæmia the characteristic change is not only a great increase in the number of white cells, but an increase specially of the lymphocytes; and in Hodgkin's disease or lymphadenoma, if there is any lymphocytosis it is very slight, and inconstant, and there is little if any increase in the white cells as a whole; there may indeed be no abnormal condition of the blood in this disease. But unfortunately, the observations of different observers are at present so discordant, that all such statements must be received with caution, and judging from blood-counts alone, it would seem that at any rate during the earlier stage of these conditions, differentiation may be extremely difficult, if not impossible.

Treatment.—For the fleshy gland tumours, a resort to extirpation is more necessary, and should be proposed in young people when the growth is steady and threatening to become unmanageable. It is too late to do anything when the disease has extended to both sides of the neck. The glands must be removed when of moderate size, if treated in this way at all.

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* *Trans. Path. Soc. Lond.* vol. xxv.

For the treatment of the more generalised growths many things have been tried, but with disappointing results. Arsenic is the remedy that is most to be relied upon. To be of use it must be pushed and taken for a long time.

Bronchial Phthisis.—By this is meant cheesy enlargement, softening, or calcareous change in the glands of the mediastinum, whether anterior or posterior, but chiefly the latter, and the associated changes, if any, with which it may be accompanied in the lung.

It has received from some authors a distinct name for two reasons—first, because some consider it may give rise to a special group of symptoms; and secondly, because the pattern of the disease in the lung is often characteristic.

The existence of large and caseous glands in the mediastinum is very common. Rilliet and Barthez say it occurs in 79 per cent. of all cases of phthisis in children; and with this proportion our own figures closely agree, for in 254 tuberculous children examined at the Children's Hospital, Great Ormond Street, the condition of the glands was specially noted, and there was caseation of the mediastinal glands in 209, that is in 82 per cent. Indeed, this is the weak point of its specialty, for it certainly is of more frequent occurrence *without* any special symptoms than *with* them, and no doubt in many cases of this and of pulmonary phthisis nothing peculiar in the distribution of the latter disease can be demonstrated. But perhaps this difficulty in part arises from a want of consideration of the fact that bronchial phthisis may be either primary or secondary. Sometimes the caseous disease of the glands is the primary disease, and the phthisis is a subsequent development; in others, it is the direct result of the pulmonary tuberculosis. There can be no doubt that caseous disease of the bronchial glands precedes any tubercular disease of the lung in an appreciable number of cases, and there can, I think also, be no doubt, from the observations of numerous writers both at home and abroad, that such enlargement is occasionally attended with peculiar and characteristic symptoms.

Inflammation of the bronchial glands can be traced in all its stages in the post-mortem room with great ease from the frequency with which it occurs. We find the acutely inflamed or swollen pink soft gland; the grey, swollen, more fleshy state of a later stage; sometimes the glands are studded with grey miliary tubercular grains; at others one part of the gland thus tubercular, another cheesy, and another, perhaps, acutely inflamed. An old cheesy deposit in a gland, and fresh tubercle extending from its borders, is quite common. We may see, again, the glands, shrivelled into calcareous masses, with more or less fibrous matting of the parts about them, and sometimes with definite adhesions to the pneumogastric or its branches. There may be evidence that they have ulcerated into the œsophagus or bronchus; and as regards the lungs and adjacent parts, miliary tubercle may spread from them to the pleura or pericardium; or, as is more common, the lung is infiltrated on one side or both with cheesy or miliary tubercle, which, leading to solidification chiefly about the root, disseminates a miliary tuberculosis of the lung far and wide, by means of the bronchial septa. The glands may be much enlarged, and extend up into the neck along the sides of the trachea. Dr. Batten has drawn attention to the fact that the glands at the root of the right lung, and on the right side of the trachea, are far more often and more extensively enlarged and caseous than those on the left side. Moreover, when perforation of a bronchus occurs it is almost always on the right side.* Our own observations gave similar results; out of fifteen cases in which a gland had perforated a bronchus, the right bronchus was affected in fourteen cases, the left only in one. They do not often lead to compression of the neighbouring canals, either respiratory or circulatory: but they tend to soften, to lead to mediastinal abscess, or more commonly, to ulceration into the bronchus or œsophagus. It is thus that calcareous masses come to be expectorated, and that evidences of bygone disease are not infrequently found in the post-mortem room. And so it happens that occasionally a child is suddenly choked by the entrance of a softened gland into the trachea by perforation of that tube.

The disease in the glands is usually associated with pulmonary tuberculosis, and not rarely with the condition I have called "cheesy consolidation" (p. 379). This change is apparently allied to that which has been denominated by Dr. Gee, "The chronic pneumonia which attends disease of the tracheal and bronchial glands." *

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* *St. Barth. Hosp. Rep.* vol. xxxi.

The conditions under which disease of the glands is likely to be present are such as pertain to cheesy glands in general, so far as any constitutional element predisposes to it; but, locally, the several conditions of catarrhal inflammation of the trachea, bronchus, and lung are the immediate causes, and thus whooping-cough, measles, rachitis, as factors in the production of atelectasis, are its most common precursors.

Symptoms.—These have already been in a measure detailed under the head of Reflex Spasm, the chapter on which (p. 318) may be referred to. But in addition to the symptoms due to spasm, there are others which may be present due to pressure of the enlarged glands upon the adjacent structures; such are, occasional difficulty of swallowing, and puffiness or œdema of the face or parts about the neck. Hæmoptysis may occur, but its interpretation would be equivocal.

As regards physical signs, dulness between the scapulæ is of some importance, indicating as it does affection of the root of the lung, a condition specially likely to occur with caseous glands about the primary divisions of the bronchi: it should always be carefully searched for over the fourth or fifth dorsal vertebra between the scapulæ, and comparison made of the space on each side of the spine. If the glands are large, some dulness may possibly be detected. The manubrium sterni and the parts on either side of it should also be examined, for although disease in the anterior mediastinum is much more rare, it is now and then present, and may reveal itself by dulness. A comparison of the breathing on the two sides often adds much to our information, some difference on the one side or the other being heard—in the way of bronchial breathing, bronchophony, or even crepitation—or some deficiency or harshness of respiration being discerned on one side or the other. The much greater frequency of extensive enlargement of glands on the right side than on the left is worth remembering also in this connection.

Dr. Eustace Smith calls attention to the occasional existence of a venous hum in these cases, due, as he thinks, to the pressure of the glands upon the innominate vein. It may be best produced by bending the head backwards, so that the face is horizontal and looking to the ceiling. I do not myself think this sign of any real use for diagnosis. I have several times heard it when there has been no evidence of any glandular disease, and it is certainly unusual even when the glandular enlargement is pronounced.

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* *St. Barth. Hosp. Rep.* vol. xiii.

The general symptoms of phthisis, wasting and hectic, are so frequently part of the clinical picture that they also must be considered to be symptoms of the special disease.

Diagnosis.—Such cases often escape notice by reason of want of care in seeking for them. The most powerful means for their detection is the ever-present remembrance of the frequency of their occurrence. But the symptoms of spasm may be very intense, and the disease under such circumstances may be mistaken for spasmodic asthma, or even for some local laryngeal disease. Perhaps the commonest mistake is to suppose a child to be suffering from whooping-cough when in reality the clangy paroxysmal cough is the result of caseous mediastinal glands. Intra-thoracic tumours, though not common in childhood, might possibly on occasion mislead us.

Prognosis.—This is always grave. The disease is too fertile a source of pulmonary tuberculosis to allow anything but fear for the result when once the existence of enlarged glands has been positively determined. But the general appearance, the existence or not of progressive emaciation, of pyrexia, and so on, must be taken into account. If the child is gaining flesh, not feverish at night, not showing other signs of ill-health, there is no reason for being over-anxious; for if the post-mortem room gives too abundant evidences of the risk, it gives much evidence also of the tendency to cure of these caseous glands.

The **treatment** should be upon the same lines as that recommended for pulmonary tuberculosis (*see* p. 384). No medicinal treatment can compare in importance with seaside air; and it is well to impress upon the parents that a short visit of two or three weeks to the seaside is not likely to do more than to produce slight and temporary improvement; a prolonged stay of several months, perhaps of a year or more, is usually necessary if the disease is to be arrested. A bracing climate usually suits these cases best. The diet must be carefully supervised, and fats should be given liberally in the form of milk, cream and eggs; nor should other food be stinted, only let the food be digestible and see that the child digests what it eats.

Drugs are not in our opinion by any means valueless in this condition; arsenic, iron, the iodide of iron, and cod-liver oil given internally have all seemed to aid in arresting the tubercular process in the glands.

CHAPTER XXIX.

TABES MESENTERICA AND TUBERCULAR PERITONITIS.

Abdominal Tubercle is found as two or three varieties—tabes mesenterica, tubercular peritonitis, and an intermediate condition, not well separable from either, in which a layer—sometimes of considerable thickness—forms upon the surface of the serous membrane, sometimes between diaphragm and liver, sometimes in the omentum, or upon the surface of the intestines uniting it with the abdominal wall. All these conditions are often more or less combined.

Tabes Mesenterica (Caseous or tubercular disease of the mesenteric glands) is very common; in 254 tuberculous children examined *post mortem* at the Children's Hospital, Great Ormond Street, it was present in 151, that is, 59 per cent.; but the condition which is recognisable *clinically* as tabes mesenterica is rare indeed. From a large out-patient department at the Evelina Hospital, during several years, and when at least 6000 or 7000 cases must have come under my observation, and probably considerably more, I have only notes of forty-six cases, and half of these were of but doubtful nature. Some are to be found associated with pulmonary tuberculosis, but as a substantive ailment we might have supposed it to be more common than it is, considering how often the term "consumption of the bowels"—often a most inaccurate and misleading term—is in use both amongst the profession and the public. Many diseases simulate it for a time. A child wastes and its stomach enlarges as a result of chronic indigestion from unwholesome food, uncleanliness, and bad air. It wastes because it is starved, and the stomach grows large, or apparently so, from flatulence combined with a tendency to contraction of the lungs and collapse which exists in feeble children. No doubt, too, in these conditions is laid the commencement of many a true case of tabes mesenterica, but it is unsafe to draw any conclusion upon the nature of the disease until such time as a child has been subjected to prolonged watching and careful treatment. Hundreds of cases like this get rapidly well with proper attention, while it is the tens only, or even the units, which have tubercular disease of the mesenteric glands.

Symptoms.—These are indefinite; wasting, increase in size of the abdomen, abdominal pain and griping after food, followed by diarrhœa, are the principal. On a more minute examination, the nightly temperature is febrile. But it is not uncommon in making inspections to find early, and sometimes moderately advanced, cheesy swelling of the glands which had not been suspected, and where, therefore, it must be supposed it had given no indication of its presence. In later cases there is some superadded ulceration of the bowels which may be the cause of the diarrhœa; sometimes tubercular peritonitis, which explains the pain. The abdominal wall is often natural, or, if prominent, soft and easily depressed; occasionally it is even retracted, so that it is very difficult indeed to say what are certainly the symptoms of uncomplicated tabes mesenterica. The only sure indication is the detection of the glands themselves by palpation through the abdominal wall. But it has always seemed to me that even this sign is of little value when it is most wanted—viz., in cases of early disease. However, it must be searched for in all cases by careful palpation round the umbilicus, by pressing backwards towards the spine, and also by manipulating the abdominal wall between the two hands from side to side. The possibility of the detection of the glands, unless they be of very large size, will depend a good deal upon the state of the intestines. If the bowels be much distended with gas, they will be overlooked. Therefore repeated examinations must be made, and in cases of doubt an enema should be administered and the examination conducted shortly after its action. Rectal examination is sometimes helpful. I have several times reached enlarged glands in this way that were not palpable from the surface. I have already hinted, as a possibility (p. 109), that attention to the bulk of the material passed may sometimes help in the diagnosis of the state of the mesenteric glands. In advanced cases the mass is large. the body thin, the intestines often retracted, and there will be no difficulty in detecting the disease; but then the general features of the case will already have left but little doubt. It may be added that a mass, which is to all appearance of glandular nature, may eventually turn out to be mostly due to coils of matted intestine.

In advanced cases other conditions arise which help towards the diagnosis, if any help be needed; the cheesy glands infect the peritoneum in their neighbourhood, and adhesions occur between the intestinal coils, and between them and the abdominal wall. It is then that irregular distension of the abdomen is liable to occur, and much intestinal gurgling and rumbling, as in chronic stricture in the adult. Sometimes the tubercular disease spreads from the hypogastric region upwards to the umbilicus, when a hard indurated cord or ring is felt round the umbilicus, and a fæcal fistula may form. Sometimes a general tubercular peritonitis arises with ascites. In these cases the fever is considerable, and the pain also, and the course of the disease tends to be rapid. Softening of the glands is only occasional. It occurs now and then, and either leads to ulceration into the intestine, or to localised abscesses amongst the intestinal coils. Hitherto I have avoided reference to the state of the mucous membrane of the bowel, because the subject is a difficult one. It is reasonable to suppose that as it is in the neck, so it is in the abdomen or any other glandular area. In the neck, I think, the evidence is almost conclusive that the glands enlarge in consequence of some local source of irritation in the district whence they draw their supplies—tooth cutting, chronic tonsillitis, adenoid vegetations and the like—and surely this holds good also for the abdominal glands. Irregularities of diet, whether of quantity or quality, arouse some follicular disturbance in the bowel. This in time leads to inflammation of the mesenteric glands, and the damaged parts become inoculated with the tubercle bacillus, and that is tabes mesenterica.

The severity of the diarrhœa will in a measure, though not altogether, depend upon the extent of the ulceration. The motions passed in these cases are usually liquid, dark brown and offensive. They sometimes, but not often, contain small coagula of blood.

The pain which some children suffer in advanced cases is sometimes very distressing. It seems to be of a severe, griping character, which, by its frequent recurrence, keeps them in perpetual misery.

Morbid Anatomy.—It hardly seems necessary to say more than has been said already upon tabes mesenterica. We would, however, emphasise two points: (1) that calcareous glands are not uncommon in the post-mortem room; (2) that disease of the mesenteric glands is only exceptionally present unless it is accompanied by ulceration of the intestinal mucous membrane—out of 132 tuberculous children in whom we found caseous mesenteric glands, 107 showed also ulceration of the intestine. It is not uncommon to find localised patches of tubercle on the peritoneal surface over these intestinal lesions, and sometimes localised peritonitis with adhesions, but it is seldom that ascites accompanies this condition. It seems possible that this may be due to the slow progress of the disease, during which adhesions are formed between the various parts of the abdominal cavity, and the serous membrane is therefore in a great measure destroyed. Ascites is the usual accompaniment of tubercular peritonitis—that form of disease in which the peritoneum is covered with sandy-looking grains; but this is an acute malady, and more commonly spreads to the still healthy serous surface from cheesy foci in the Fallopian tubes, or from some cheesy mass in the omentum or between the liver and the diaphragm.

Diagnosis.—This is perhaps only to be made absolutely by being able to feel the glands. But wasting, nocturnal fever, abdominal pains, and brown, watery, offensive evacuations, combined perhaps with such slight local abdominal indications as fulness, lumpiness, &c., will often make this as nearly certain as can be.

As regards the glandular lumps, fæcal accumulations are often puzzling; the question between them must be decided by having recourse to enemata and frequent examination, rectal and other. Both Hillier and Rilliet and Barthez allude to cases in which cancer of the abdominal viscera caused some difficulty—one in the pancreas, the others in the kidney.

I had under my care at one time a child who presented similar difficulties, and unfortunately the parents obstinately refused to allow our doubts to be cleared up when the child died.

A boy of four, under the care of Mr. (now Sir) Hugh Adcock, had been ailing for six months with pain in the abdomen and progressive emaciation. There had also been an ill-defined fulness in the epigastric region, which had been thought to be due to hepatic enlargement, more particularly as there had been some slight jaundice. He was admitted into the Evelina Hospital, a few weeks before his death, in a state of extreme anæmia and emaciation, with a distended abdomen, and a firm deep-seated mass high up in the region between the left lobe of the liver and the spleen. There was also a double optic neuritis, for which, as he had no cerebral symptoms of any kind, we were unable to account, except on the supposition that the disease was of lymphadenomatous nature, and the neuritis such as sometimes accompanies the anæmia of that disease. He became gradually more exhausted, and his breathing more distressed, due to the bases of his lungs becoming implicated, and to the formation of fluid in the left pleura. The tumour in the abdomen did not appear to increase rapidly, although there was probably some further growth, as the veins of the abdominal wall became considerably distended; but the more remarkable feature of the last few weeks of life was that his forehead and head became rapidly covered with a series of bosses, which could hardly have been other than sarcomatous growths.

Such conditions can, however, but rarely trouble one, although large tumours of the kidney are not uncommon. It is, perhaps, of more importance to distinguish, if possible, between tabes mesenterica and those cheesy masses to which I alluded at the commencement of the chapter; for although the two are, as I said, often combined, yet the latter sometimes run a very chronic course, and may ultimately disappear. One other condition may be mentioned as sometimes causing much difficulty, viz., sub-acute inflammation around the appendix vermiformis and abscess therefrom amongst the intestinal coils. We have seen several cases of this kind, which, having been supposed to be tubercular, turned out otherwise. (*See* p. 442.)

Prognosis.—In former times tubercular peritonitis and tabes were looked upon as hopeless; but latterly, for both these diseases good evidence has been shown that they may resolve. I have already alluded to Dr. Habershon's patient, who, thirty or forty years before her death from tubercular meningitis, suffered, as it was supposed, from tubercular peritonitis, and have told how this opinion was confirmed at the autopsy. I will say again, for it is an energising fact, amid much that is grave and disappointing, that calcareous relics, by their presence upon the post-mortem table, not infrequently give evidence of the spontaneous cure of cheesy glands. Surgeons, in operating upon ovarian and other abdominal tumours, have sometimes *seen* tubercular disease of the serous membrane, yet the patients nevertheless recovered; and lastly, I may adduce as evidence—perhaps less satisfactory, but still worth regard after such unerring facts as these—that it is the impression of many physicians that these cases are by no means hopeless. It is probable that the forecast will in a measure depend upon the nature of the case. Miliary tuberculosis of the peritoneum is sometimes associated with much pyrexia, pain, ascites, and emaciation, a state of things that makes the outlook grave, although not hopeless; with less acute symptoms and less disturbance of system, the ascites may disappear under the local application of a mercurial and the patient recover; the disease that takes the form of intestinal ulceration is the most hopeless of all; and as regards the case of tubercular tumours, some of them also probably get well. This is not the case, however, so often as I had thought, for they are of frequent occurrence, and I have known many come into hospital and leave after a stay of some weeks materially better, and then disappear from view. My friend, Dr. George Carpenter, physician at the Evelina Hospital, was at much pains to trace all our cases (his and mine), and he has so far been successful that of sixteen he found out fourteen. Of these, six were well, eight had died. Dr. Osler has published an elaborate analysis of a similar series of cases, and comes to a like conclusion.

The outlook will necessarily be grave, the result, in the majority of cases, fatal; but any things which make for returning health, such as absence of fever, diarrhœa, wasting, &c., may be seized upon as indications for hope.

Treatment.—However much one may hold to the constitutional origin of this disease, no one can hesitate to attribute much of the immediate outbreak to catarrhal states of the mucous membrane of the bowel, and to the abnormal work which falls upon the glands in consequence of inflammation and other conditions, the result of improper feeding; and no one, also, can refuse to admit that, with the lacteals largely blocked and the glands practically destroyed, the preservation of life from starvation and the remedy for the disease must largely lie in the careful adaptation of a diminished work to the diminished capacity of doing that work. In other words, the cardinal treatment of tabes mesenterica consists in the most strict attention to dieting the patient; giving no more food than is necessary and seeing that the quality of that which is taken is such that the intestinal lacteals may have as little work to do as possible. To this end it seems that beef-juice, mutton broth freed from fat, chicken broth, eggs, and light fish afford the most appropriate diet. Milk and suet and fats should be given more sparingly, and carefully watched; their assimilation can be accurately gauged by the state of the evacuations and the gain of weight under their administration. If they are digested, well and good; if not, it is better to withhold them for a while. Fat may in a measure be replaced by sugar under such circumstances, the absorption of which goes on readily, while vigorous inunctions may in some degree replace the fat which is temporarily withdrawn from the intestinal canal. Additional aid may be obtained from maltine and the various digestive fluids which are now prepared, as much digestion being accomplished outside the body as is possible. The stomach will thus do more, the diseased surface less, and some rest will be given to the latter, so as to allow of the recovery of a more healthy state.

As regards drugs, there can be no doubt of the good effect of tonics, such as iodide of iron and the various phosphatic preparations, whether phosphites or phosphates. Cod-liver oil is often given too indiscriminately, and in too large quantity. Its digestion should be carefully watched, the child frequently weighed and its evacuations examined, so that no more may be given than is well disposed of. Inunction is a capital plan for administering the oil, but it is too repulsive to be strongly recommended, and in most cases I prefer olive oil for this purpose. Of other remedies, I believe chloride of calcium to be of value, and, perhaps, small doses of iodoform. The former may be given to children three years old in five-grain doses with liquorice, and the latter from half a grain or so. If any lumps can be felt near the surface, a five-per-cent. solution of the oleate of mercury may be painted over the surface of the abdomen for four or five days, and repeated again at frequent intervals. In cases where there is much abdominal pain, small doses of Dover's powder are very useful; two and a half grains may be given to a child of four or five twice or three times a day, if necessary. The child should be kept very warm, and removed to some dry air inland, or to some bracing seaside place.

Tubercular Peritonitis.—This affection is probably more frequent during early childhood than at any other period of life. Amongst the fatal cases of tuberculosis in children tubercular peritonitis figures as the cause of death in a considerable number: in 266 consecutive autopsies on tuberculous children at the Hospital for Sick Children, Great Ormond Street, tubercular peritonitis existed in forty-five cases, that is, in 16·8 per cent. As a fatal condition it would seem to be more frequent in infancy than in later childhood; the age incidence in 100 consecutive cases verified by autopsy can be seen from the following table:

Under six months	None
Six months to one year	8
One year to two years	25
Two years to three years	13
Three years to four years	15
Four years to five years	9
Five years to six years	6
Six years to seven years	5
Seven years to eight years	4
Eight years to nine years	6
Nine years to ten years	2
Ten years to eleven years	4
Eleven years to twelve years	1

Girls and boys are probably equally liable to tubercular peritonitis; our own statistics showed 52 girls to 48 boys; those of Rilliet and Barthez gave 33 girls to 53 boys.

At least two varieties of this condition are met with in children; one in which the peritoneal cavity is gradually obliterated by adhesions, the *plastic* form of tubercular peritonitis; the other, the *ascitic* form, in which the deposit of tubercle in the peritoneum causes effusion of fluid into the peritoneal cavity.

The plastic form is much the commoner of the two, and even in the cases where ascites occurs the disappearance of fluid, either naturally or by artificial means, is often followed by adhesions, and all the symptoms of the ordinary plastic tubercular peritonitis.

The earliest symptoms are much the same in all forms of abdominal tuberculosis. The child is ailing, the bowels are irregular, diarrhœa, perhaps, alternating with constipation; there are sometimes but by no means always colicky pains, and there is wasting. It is by palpation of the abdomen that the diagnosis is made in most cases; in tabes mesenterica, as already stated, the hard nodular mass of enlarged glands may perhaps be felt. The presence of fluid in the ascitic form of tubercular peritonitis is usually evident from the fluid thrill and the shifting dulness, but the nature of the ascites may only be determined by the history and the subsequent course, while in the common form of tubercular peritonitis—the plastic variety—the feeling of the abdomen is so characteristic that, apart from any other evidence, a diagnosis can often be made from palpation alone. No mere description can teach the student what this feeling is; the tactus eruditus must be gained from clinical experience; but one may say that the abdomen in these plastic cases has in the early stage a more or less uniform doughy consistence, which as it increases gives the idea that the whole abdomen is packed with some semi-solid material. In many cases a transverse mass about an inch wide can be felt extending across the abdomen above the umbilicus, and sloping upwards from the right hypochondrium towards the spleen; this transverse mass, the omentum infiltrated with caseous material, is easily mistaken for the edge of the liver.

As the disease progresses, the wasted limbs and upper part of the body contrast strikingly with the full abdomen; the child is quiet and apathetic, perhaps signs of tubercle appear elsewhere, emaciation and exhaustion increase, and the child dies. In some cases the abdominal disease goes further; the tubercles in the peritoneal adhesions caseate and soften, or one of the matted coils of intestine is perforated by ulceration from within or without, and in either case an abscess results; reddening and induration appear about the umbilicus, which is bulged and thinned until the pus discharges, and a troublesome fistula, perhaps discharging fæces, is formed.

It is surprising how little pain there is as a rule with tubercular peritonitis, but in rare cases an acute septic peritonitis results from perforation of the bowel before the peritoneal cavity is entirely obliterated, and in these cases there is acute pain with collapse and rapidly fatal result.

The **prognosis** of tubercular peritonitis has already been considered in connection with tabes mesenterica. That the disease is by no means always fatal is evident from statistics recently published by Dr. G. A. Sutherland. Out of forty-one children with tubercular peritonitis, twenty-nine recovered, fifteen of these twenty-nine cases had been kept under observation for periods varying from two years to six years. We have seen cases where there seemed to be extensive matting of the intestines by tubercular peritonitis recover apparently completely, except that the abdomen probably seldom becomes quite so supple as it should be; and we have seen many cases improve whose subsequent course was not traced. An important point in the prognosis of all forms of abdominal tuberculosis is the possibility of securing good feeding, and above all, country air.

As to the significance of particular symptoms the occurrence of ascites with little or no pyrexia is not an unfavourable symptom, indeed we are accustomed to regard these cases as more hopeful than the dry plastic cases with much thickening and matting detected on palpation. The ascites often represents an early stage which later on is followed by adhesions; few cases die in the stage of ascites. There are, however, cases in which the onset is acute with severe symptoms of pain and high temperature, sometimes with ascites, sometimes without, these often prove fatal very rapidly. Prolonged pyrexia in any case is of sinister significance, as also is the occurrence of much diarrhœa which probably points to ulceration of the intestine. Rapid and great wasting is also a bad sign, and as the child becomes weaker and more emaciated, the appearance of purpura, which is apt to occur on the chest and abdomen, and also the occurrence of œdema of the limbs—a symptom which in the lower extremities and genitals is sometimes the result of the intra-abdominal pressure—all point to a fatal termination. From some observations made by one of us at Great Ormond Street, the average duration in fatal cases appeared to be about four or five months.

Morbid Anatomy.—The whole peritoneum is usually thickened and velvety, and often can be peeled off the intestine like a glove off a finger. The coils of intestine are adherent to one another, and often to the parietes; the adhesions are studded with grey or caseating tubercles, and sometimes enclose small pockets of pus or serum. There may be a larger cavity enclosed by matted coils of intestine, one of which has perforated and allowed the fæces to escape.

Ulceration of the intestine is generally present in tubercular peritonitis, but not always. We found it in fifty-four out of seventy-seven cases; perforation may occur, as we have several times seen when only one or two ulcers are present. The mesenteric glands are generally more or less caseous, but sometimes only very slightly. In the ascitic variety the whole of the peritoneum is covered with sandy-looking grains: it is then sometimes an acute malady and possibly originates in a blood infection, or from some cheesy focus, glandular or otherwise, as do other forms of acute tuberculosis.

Treatment.—Tubercular peritonitis was regarded formerly as amenable only to medical treatment, whether climatic or by drugs, administered externally or internally. But within recent years, owing chiefly to the observation that some cases recovered in which tubercles were noticed on the peritoneum during laparotomy for other conditions, the practice of surgical treatment for tubercular peritonitis has been widely recommended. Some surgeons have even advocated laparotomy as a routine measure for all cases of this disease, others would allow a short time for trial of medical treatment, and if no improvement occurred, would then proceed to surgical measures. Mr. Watson Cheyne has stated as his opinion that "in practically all cases where improvement does not follow under medicinal treatment after a reasonable time, say, in from four to six weeks in acute cases, to four to six months in chronic cases, the abdomen should be opened whether there be ascitic fluid or not." Others again would limit the scope of surgical inteference to cases in which the peritonitis is accompanied by more or less ascites.

Now the treatment of tubercular peritonitis by laparotomy rests almost entirely upon two assumptions: first, that the child's chances of recovery under medical treatment are but small; and, secondly, that laparotomy has some occult influence in curing tubercle of the peritoneum.

Undoubtedly tubercular peritonitis is often a fatal disease, but it is our own experience, as it is that of other physicians, that with suitable climatic treatment, rest and good feeding a certain number of cases recover; according to some recent statistics by Dr. G. A. Sutherland, out of twenty-seven cases treated medically, twenty-two recovered, one was unrelieved, four died; whilst out of fourteen cases treated surgically, seven recovered and seven died. Nineteen of the cases recorded in these statistics as "recoveries" had been kept under observation more than a year. Whether larger statistics would show so high a proportion of recoveries under either method of treatment is perhaps doubtful, but such figures are sufficient to show that laparotomy as a routine treatment is unnecessary, and therefore unjustifiable. But there still remains the important question whether in cases which have failed to respond to medical treatment, laparotomy should be done. The operation has been recommended from two entirely different points of view, one that merely opening the abdomen, whether there be ascites or not, has some curative effect; the other, that ascites which fails to disappear under medical treatment may be cured by laparotomy. Now with regard to the first point it is only right to state that, in the opinion of some careful observers, laparotomy has no such curative influence as has been claimed for it, and with this opinion our own experience entirely accords. It may be added that some experiments carried out recently on animals with the object of testing this particular point showed that laparotomy had no influence either in promoting or arresting the tubercular process.

The relief of ascites is a very different matter, and here it may well be that great distension with much discomfort may occasionally call for surgical measures, but we would point out that the conversion of an ascites into a dry peritonitis is not the same thing as cure of the disease, in most cases indeed, without any surgical interference, the fluid gradually disappears, being replaced by more or less matting of the peritoneum. With the understanding, therefore, that surgical measures are confined to this group of cases, we think that evacuation of the fluid through a small incision may sometimes be advisable. It is conceivable that the alteration of vascular conditions which must necessarily result when intra-abdominal pressure is thus relieved, may have some influence upon the local tubercular process, but even this is uncertain.

We have already expressed our doubt as to any curative effect from laparotomy in the dry plastic form of tubercular peritonitis, but as to the dangers and the occasional disastrous results of this operation in these common cases of matted tubercular peritonitis, our experience leaves us in no doubt whatever. The peritoneum is often so matted together that it is difficult to be sure when the peritoneal cavity has been reached. The coils of intestine are embedded in caseous deposit, and often the wall of the intestine is already thinned by tubercular ulceration, so that the risk of wounding the intestine whether by incision or by merely breaking down adhesions is a very real one, and even in the hands of skilful surgeons we have seen this operation to result simply in a fæcal fistula, which has made the child's plight only worse than before, and, moreover, where such a result does not occur at the time of operation a fæcal fistula sometimes forms soon afterwards, apparently from interference with the support which was previously afforded to some neighbouring ulcerated portion of intestine by the general adhesion of adjacent structures.

To sum up, we may say that in our opinion the scope of surgery in the treatment of tubercular peritonitis, apart from special complications, is very limited; in some cases of extreme and prolonged tubercular ascites, laparotomy may be advisable, but in the much commoner or dry matted tubercular peritonitis laparotomy is rarely, if ever, to be recommended. Of complications which may call for laparotomy in this disease, one of the most urgent, and fortunately a rare one, is the occurrence of severe pain with vomiting and sometimes with marked visible dilatation of coils, and with much visible peristalsis. Such attacks may become more and more frequent, until it is evident that obstruction is considerable, and if life is to be prolonged there may be no choice but operation; this must, however, be a last resource, for it will probably entail a difficult search for the seat of constriction amongst the general matting, a proceeding necessarily fraught with much risk. Occasionally, also, some acute localised suppuration from perforation of the intestine or septic infection without perforation may call for surgical treatment, but where reddening and protrusion of the umbilicus gradually shows itself, it is generally better to allow spontaneous opening to take place. The medical treatment of tubercular peritonitis consists first and chiefly in placing the patient under the best possible conditions of climate and hygiene. As soon as a diagnosis of the disease has been made the child should be sent to the seaside, and must remain there for many months. As a rule these children do best in a bracing climate, Kent coast watering-places particularly. Herne Bay, Margate, Broadstairs, and Ramsgate generally suit such cases excellently during the greater part of the year, but from January to the end of March better results may be obtained by sending the child to places with less easterly aspect, such as Worthing or Bournemouth. The child should live as much as possible in the open air, and should be kept lying down for six months or more if the disease still shows signs of activity in recurrence of ascites, or increasing abdominal resistance on palpation, or infrequent diarrhœa, or rises of temperature; the child should be taken out lying down in an invalid perambulator, and indeed may spend great part of the day out of doors in this way.

The diet should consist largely of milk, milk-pudding, custard and eggs, and if such foods as Benger's or Ridge's, or fine oatmeal which are prepared with milk, are liked, there is no objection to these; but it may include also finely minced meat, fowl or fish with gravy or soup, but only very little vegetable of any sort and potato in particular must be partaken of very sparingly. Fruit juice, or soft baked apple may be taken, but otherwise fruit in general, especially raw fruit, is to be avoided.

The objects to be aimed at in the feeding are to avoid the production of fermentation in the bowel such as arises from much starch or excess of sugar in the diet, and also to avoid foods which may leave much irritating residue, such as the pips and shreds which are left by most fruits. Drugs, although less important than the climatic treatment, are not to be despised. For internal administration we think that creosote in small doses is of value, and it may be usefully combined with cod-liver oil emulsion, or with malt. There are several excellent preparations of this kind now prepared by various well-known druggists; a minim or half a minim of creosote in a drachm of the mixture is sufficient, and should be given after meals three times a day. We have used also syrup of the iodide of iron, and we think with advantage: 20 or 30 minims may be given three times a day in water, or one of the preparations of malt with iron iodide which are now sold, may be less distasteful to the child. In cases with ascites we have seen improvement follow the administration of iodoform internally, half a grain may be given in a cod-liver oil emulsion. The formula which we have used is the following: Iodoform gr. i, Tinct. Lavandulæ Co. ♏ xv, Ol. caryophylli ♏ ⅓, Emuls. Ol. morrhuæ ad. ʒij: of this one drachm may be given three times a day after meals.

If the appetite fails, Fellow's syrup of the hypophosphites or Easton's syrup, in doses of 10–30 drops according to the age, may be given, or one of the preparations of phosphates without strychnine, the syrup ferri. phosph. Co. ʒi, or simple acid phos. dil. ♏ v–x, with a little glycerin. and water may be used.

The value of external applications to the abdomen is uncertain, but there is no doubt that rapid absorption of some drugs can be effected in this way; iodoform in particular, which has been specially recommended by Dr. Burney Yeo for application to the abdomen in those cases, can be detected in the urine in less than two hours after its application. Mercury has long been used thus, and in the opinion of careful observers it has a distinct value. The unguentum hydrargyri may be gently smeared over the abdomen, or the oleate of mercury may be painted on, or a preparation of unguent hydrargyri ʒi, extract belladonnæ ʒi, Ol. olivæ ℥i may be applied; whichever is used, a flannel binder should then be wrapped round the abdomen, and the application should be renewed each evening, and washed off gently in the morning. Iodoform may be used, as suggested by Dr. Burney Yeo. An ointment composed of equal parts of iodoform ointment and olive or cod-liver oil is gently rubbed over the abdomen once or twice a day; but caution is needed, for we have seen the external application of iodoform produce sickness. Half a drachm of this preparation is ample to begin with. Any of these applications may make the skin a little sore; if so they should be discontinued for a day or two to be resumed in due course.

CHAPTER XXX.

PERITONITIS—APPENDICITIS—ASCITES.

Peritonitis sometimes occurs in the *fœtus,* when it is due either to syphilis or to septic infection from the mother. Gerhardt states that many cases of congenital stenosis of the intestine are dependent upon peritonitis, although other writers have affirmed that they are the result of volvulus occurring during intra-uterine life.

In the *newly born* peritonitis is also septic, usually suppurative, and occurs in association with unhealthy inflammation at the umbilicus, sometimes also with acute epiphysitis. It is accompanied by high fever, vomiting, and distension of the abdomen, and in most cases in males the patency of the infundibuliform process of the peritoneum allows of the escape of fluid into the tunica vaginalis. In nine cases out of ten it is the right tunica that fills, and œdema of the scrotum often exists at the same time (Sanné from Quinquaud). Again, it appears sometimes to be due to syphilis (West), associated with enlargement of the liver and spleen—which rapidly disappears under a mecurial treatment—and I have myself seen extreme ascites from this cause in an infant a few months old.

In older children the remark holds good for peritonitis as for ascites, that authors are inclined in many cases to attribute to chill an important share in its production. Some talk, also, of a rheumatic peritonitis; and I have seen cases in which the question of a rheumatic origin crossed the mind, but which are valueless as evidence from the impossibility of proving the point.

Peritonitis may also occur after scarlatina or other fevers, when it is prone to be of a suppurative kind. It occurs also sometimes in children with nephritis not necessarily scarlatinal in origin. But it is more often secondary than primary; that is to say, it is usually an extension from some disease of the viscera which the serous membrane envelops, or of parts in near proximity. Thus, it is not uncommon to find a local inflammation of the peritoneum which has extended from the neighbouring pleura. In girls an acute peritonitis is sometimes associated with vulvo-vaginitis, and the presence of gonococci in the vulval discharge has been taken as evidence that the peritonitis also was gonorrhœal in origin. In these cases the infection reaches the peritoneum, no doubt, by extension along the Fallopian tubes, and laparotomy has demonstrated this in some cases. It may occur also as the result of injury; it is not uncommon in boys and youths after falls, blows, or excessive muscular exertion; and in adolescent females the changes that take place in the pelvic viscera during the establishment of the menstrual function may light it up. It is sometimes due to rupture either of spleen or liver; in rare cases to ulceration of the stomach, or gastritis; sometimes, again, to the ulceration of typhoid fever; and, of more importance, because more frequent than any of these, to ulceration of the cæcal appendix.

The **symptoms** are pain, fever, vomiting, and constipation. In most cases there is more or less distension of the abdomen, which moves less than normal with respiration. Œdema of the abdominal wall is sometimes present, generally indicating a very acute if not suppurative form of peritonitis. Tenderness on palpation is sometimes very marked, but by no means always; a child may be suffering from suppurative peritonitis and yet allow free palpation without any apparent tenderness.

The **diagnosis** is often difficult: internal strangulation of any kind is not a common affection in childhood and some of the more acute forms of enteritis will produce similar symptoms. In obscure cases where external palpation fails to clear up the nature of the condition, rectal examination should be employed; occasionally valuable information may be obtained in this way, whether of appendix mischief or of affection of the pelvic organs.

The **prognosis** will depend upon the severity of the symptoms. The more the vomiting, distension of abdomen, pain, rapidity and wiriness of the pulse, so much the worse the case, as a rule. It is noteworthy that in the peritonitis which accompanies vulvo-vaginitis, recovery is the rule. Eight cases observed by Comby in girls four to thirteen years of age all recovered, and this has been the experience of others; moreover laparotomy is very rarely necessary in these cases, they recover with such simple measures as rest in bed, and the application of hot fomentations to the abdomen.

Treatment.—Opium must be given freely by the mouth, warm poultices applied to the stomach, and the patient fed upon the blandest diet, and very little of it. The child may suck ice, and take milk and water, Brand's essence, strong beef-tea, &c., by the spoonful; and in cases of any severity it is better to keep the child for a short time entirely to suppositories or nutrient enemata. The question of surgical interference must be considered carefully; as mentioned above there are cases, and some of these cases with very acute and severe symptoms, complicating vaginitis in children, which require no operative treatment whatever; but in any case of acute peritonitis of obscure causation in a child, we are confronted with the possibility of appendix trouble, and in some of these doubtful cases an exploratory operation may be the wisest course.

Appendicitis (Perityphlitis).—I have purposely reserved ulceration of the cæcal appendix for consideration as a disease of the peritoneum, because the student is apt to think much of the ulceration and less of the peritonitis. It used to be common to hear the disease talked of as "perityphlitis," with some idea of disease outside the peritoneum in the subperitoneal tissue. But the whole importance of the affection lies in the fact that it is always a localised peritonitis, and not uncommonly a severe inflammation. A halting opinion on this point is fatal. An aperient given to drive on what was supposed to be a scybalous concretion has over and over again led to the death of the patient by interfering with newly formed adhesions, and by thus giving rise to a general peritonitis, and a peritonitis which is very likely under these circumstances to be suppurative.

These cases are so misleading, and withal so critical, that I shall venture to drive home the more important points by constructing a case, as the sum of my experience. A child of seven is exposed to a chill, and seems ailing. He complains of a pain in the right iliac region, but this seems of no severity, and very little notice is taken of it. Suddenly, after a meal of perhaps not the most digestible food, the pain becomes worse, and he is sick. The sickness is associated with constipation; both are obstinate for three or four days; the case is considered to be one of intestinal obstruction, and aperients and enemata are administered to get the bowels open. There is no fever, and an additional argument is drawn from this, that the nature of the case is obstructive, and not inflammatory. At last the bowels act, to the great relief of the parents, but quickly a fresh anxiety crops up, "diarrhœa" replaces the constipation—and now the tale is that the child is doing well if only the diarrhœa would stop, which is wearing it out. There is now, perhaps, some fever, but not necessarily any; the abdomen is a little tender, but hardly enough to attract notice: it may be moderately distended, or natural and quite soft. The sickness has all stopped, but the pulse remains at 120 to 140. The bowels continue to act frequently; the pulse quickens still more, becomes unsteady, and finally fails altogether, after an illness of perhaps two to four weeks. At the inspection ulceration of the cæcal appendix is found and a general suppurative peritonitis. Now, I have not sketched here the most acute cases, because they compel immediate attention, and the pinched face, sunken eye, and thready pulse betoken acute peritonitis to the most unobservant.

But the account I have given is that of a more insidious class, in which most mistakes are made. Nor is it difficult to see why. In the first place the early symptoms indicate nothing definite unless the rule is absolutely adhered to that griping abdominal pain, especially if there is any sickness, requires a careful examination of the child in bed before any treatment is adopted. It is purgation at random that kills. Secondly, the symptoms are those of intestinal obstruction—pain, vomiting, and constipation. And there is intestinal obstruction, but it is paralytic from peritonitis, not mechanical. Obstruction as we understand it is rare in childhood, except from intussusception, when, if *acute*, it generally occurs at a much earlier age. At all ages there are many cases in which it is impossible to decide between peritonitis and obstruction, but in children, the former, being far more common, has the chances all in its favour. But, however this may be, the treatment will be much simplified if we take this general rule, that *all* cases of obstruction, whether due to peritonitis or other conditions, *primâ facie* call for opium and belladonna, not for aperients. Thirdly, the absence of fever misleads some. It ought never to do so. It is true that in most cases of the kind we are discussing there is more or less pyrexia; nevertheless, there are not a few in which, from beginning to end, the temperature is normal, or sub-normal; and further, a normal temperature with rapid pulse and diarrhœa is a herald of the ugliest mien. Fourthly: "But the abdomen is not distended, and there is no pain on pressure." Negative indications of this kind are not to be depended upon if the disease is suppurative. An acute plastic peritonitis will generally give immobility, distension, and pain; not so pus in the peritoneum. There will generally be a little tenderness to careful examination; perhaps nothing more.

Causes.—The appendix is, generally speaking, thickened; often dilated; and not rarely contains a small scybalous concretion. Small bodies of any kind may pass into this part of the bowel and set up ulceration; and the disease, moreover, occasionally occurs in tubercular subjects. It is an interesting question why inflammation of the cæcal appendix should be more common in young than in older patients. That it is so there can be no doubt. Several things may in part explain this. In the first place, it seems often to occur in such subjects as give indications of delicacy, and sometimes, though probably not often, it is associated with tubercle. The greater heterogeneity of diet in young people must also be taken into account, and also, too, the more active intestinal action, which is characteristic of the time of life. Possibly, therefore, small scybalous masses are more prone to enter the vermiform appendix in young people, and to start an insidious inflammation and ulceration. It may be, too, that there are causes of acute inflammation in this region of which as yet we have no positive knowledge. It not uncommonly comes on after prolonged or excessive exertion.

Symptoms are those of peritonitis, but it is a disease which varies much. It is often quite insidious in its onset, stomach-ache and irregularity of the bowels being the only complaints perhaps for several weeks. If it be more acute, there may be vomiting and constipation, with thickening in the region of the cæcum, and immobility of the abdomen, and in the worst cases it may be associated with such severe febrile disturbance as to be mistaken for typhoid fever.

The peritoneum is very treacherous in its reference of pain to particular spots. It is not uncommon for disease in one spot to cause pain in quite another, and, for this reason, appendicitis is likely to be overlooked. Therefore any griping abdominal pain of frequent recurrence should demand a careful examination by palpation of the abdomen, and one may hope to find some fulness, ill-defined thickening, or definite induration, to confirm the diagnosis if the disease be present.

Diagnosis.—In the absence of much local pain or swelling, and in the presence of general fulness of the abdomen and symptoms of blood-poisoning, it may be mistaken for typhoid fever. I have, too, seen a child suffering from bright jaundice and fever, where the diagnosis of disease of the appendix cæci could only be surmised as being the most likely cause (by means of hepatic abscess) of the jaundice that existed. Local symptoms were quite in abeyance. Sometimes the local disease gives rise to an abscess which burrows in one direction or another, and which subsequently makes its appearance in some other part of the abdomen altogether. On the other hand, it may be difficult to distinguish between scybala in the bowel and inflammatory products around it; but, whenever there is any doubt, one should always err on the side of caution, as an aperient treatment may be most disastrous.

Tubercular inflammation of the glands between the cæcum and ileum not unfrequently gives rise to slight tenderness and increase of resistance in the right iliac fossa, which, with the associated constipation and irregular temperature, may closely simulate perityphlitis. The more gradual onset, and the presence of symptoms of tubercular disease elsewhere, may point to the tubercular character of the inflammation, but in some cases its nature is only determined by the subsequent development of general tubercular peritonitis. The passage of a small renal calculus may simulate it very closely.

Prognosis.—If the symptoms are at all acute, the disease is one of much danger. The more the vomiting and the constipation, the more the peritonitis, and, therefore, the more the risk. But it can hardly be taught too strongly that early recognition of the disease, and appropriate treatment, enhance considerably the chances of success. A tendency to recurrence is a feature of these cases.

Treatment.—This is one of absolute rest. Opium and belladonna should be given internally, and poultices applied to the abdomen. The diet will be similar to that for any other case of peritonitis; iced milk and beef-tea in the early stages of the inflammation, and later some relaxation of *régime* in the direction of custard. In critical cases the quantity of food given by the mouth must be very small, and possibly everything but ice withheld, nutrient enemata or suppositories being administered instead. Enemata, to empty the rectum, may be used with caution, if necessary. In the more chronic cases, I believe some advantage is gained by applying a 5 per cent. solution of oleate of mercury to the abdominal wall over the thickening; or the combination of mercurial ointment, extract of belladonna, and olive oil, already alluded to (p. 436).

Supposing that the disease becomes thoroughly localised an abscess may form, and it is important to be aware of this and to be on the look-out for its occurrence. The parts must be carefully handled, for fear of disturbing any adhesions; but attempts should be made, from time to time, to ascertain whether there be any fluctuation or not. In such a case, an early opening of the abscess will add materially to the chances of the child's recovery.

Care must be exercised for some time after any severe attack of this kind. The matting and adhesion of the parts is often considerable, and for long afterwards there may be pain on any active exertion. Moreover, there are not a few recorded cases where a want of caution has led to a recrudescence of the original malady—sometimes, unhappily, with a fatal result.

But I would not leave the question of treatment without some more distinct allusion to the intervention of surgery. Peritonitis of all sorts is passing more and more into the hands of the surgeon, and many remarkable successes have now been recorded in cases which might well have been deemed desperate. Regarded from the point of view of the physician the subject stands thus: A number—it is difficult to say how many, but probably a large majority—of these cases, if treated judiciously, get perfectly well; and for such, an operation, however successful, might well be called meddlesome. In others the inflammatory process localises itself, when, if the symptoms indicate no progress towards recovery, or are in any degree urgent, an exploratory incision is not only justifiable, but demanded. But there come those other cases I have described, where the peritonitis is general and in which the life of the child is balancing. Then it is that the experience of other cases hardly better that have struggled through; the incubus against anything of the nature of an operation which is of the very breath of the atmosphere of "home"; the fear that a serious undertaking, such as opening the abdomen, may extinguish the last hope; the doubt that must exist whether, if an operation be begun, any relief can be afforded, and similar considerations, make turmoil when we most need to be dispassionate, and must needs make us ask whether in such cases we can ever cease to halt. We can be wise after the event and talk glibly of the advantages of early operation, but this is small help to us when the point aimed at is so to time our measures as to be neither too soon nor yet too late. Nor do I think any precise rules can be established; but, on the whole, the trend of opinion now seems to be to let the acute cases alone if possible, but there are cases where an immediate operation gives the only chance. If after four or five days the symptoms be not sensibly ameliorating, especially if there be any local thickening, an exploration has a very fair chance of reaching pus. And such cases, when successfully drained, show a good proportion of successes. In the recurrent or relapsing cases, having made sure of the diagnosis (not always easy) all are agreed that the removal of the diseased appendix during a quiescent period is the proper treatment, and is then attended with but little risk.

Peritoneal Abscess, or localised suppurative peritonitis, occurs also occasionally after scarlatina or other debilitating diseases.

In three such cases which have occurred to me, one was attributed to typhoid fever, one followed scarlatina after some considerable interval, and in one no cause could be assigned. In one of these cases the abscess had already opened spontaneously at the umbilicus, from which there was a free discharge of thin pus. In the other two there was a diffused fluctuating swelling, dull on percussion, in the lower part of the abdomen. In one case there was severe constitutional disturbance; in another, slight fever; in the one, which had opened spontaneously, none. In all there was some abdominal pain.

Diagnosis.—One of these cases was sent to the hospital for retention of urine, and the position of the swelling in the median line and lower part of the abdomen much resembled that of a distended bladder or miniature pregnancy. A positive opinion can hardly be arrived at without exploration. This was done by means of a hypodermic syringe in two of the cases alluded to, but probably a small incision is generally safer.

Localised peritoneal abscesses, from whatever cause arising, are occasionally very misleading in the physical signs that are produced. I have now on more than one occasion been called to see a case that from the amount of distension had all the appearance of acute generalised peritonitis, but in which a careful exploration in the right iliac fossa tapped an abscess of some size behind the intestinal coils.

Treatment.—As soon as there is an evident collection of fluid which does not disappear by remedies—or should there be a severity of the constitutional disturbance, or other reasons requiring interference—an exploratory incision should be made through the abdominal wall, and, pus being found, a free opening should be made at that part which seems most suitable for the particular case. The contents of these abscesses are usually very fœtid; nevertheless washing out the cavity need not be adopted immediately. It will be sufficient to allow free drainage by means of a tube; taking care, by the application of iodoform, or antiseptic gauze, to keep the external parts as sweet as possible. Very foul cavities treated in this way have a good chance of becoming quite inoffensive within a few days, by natural effort if the patient be otherwise sound. Persistent fœtor is a blotch upon the escutcheon of the "constitution." And, as with empyemas, I believe all interference with the walls of the cavity is to be avoided if possible. This, however, is a matter upon which some difference of opinion may reasonably be expected to exist.

The wound must be dressed as often as is necessitated by the discharge, and as this diminishes, the drainage tube may be removed.

The child must, of course, be kept in bed for some days, and fed upon the lightest diet, such as milk, beef-tea, blancmange, &c. In critical cases it will be necessary to take to beef juice and such like articles, or to feed the patient for a time by enemata. A little Dover's powder may probably be necessary to relieve the pain for some few days. The bowels can be relieved by enemata, and subsequently some quinine, iron, and phosphoric acid will form a good tonic and help on recovery.

Ascites is not a very common occurrence in childhood, apart from such obvious causes as diseases of the lungs, heart, kidney, or liver. It may be due to tubercular peritonitis, or some tubercular affection of the abdominal glands. Yet it would appear that a *simple* dropsy of the peritoneum is of more frequent occurrence in children than in adults. Ascites is sometimes due to cirrhosis, and other enlargements of the liver, such as syphilitic or lardaceous disease; it may also be associated with enlargement of the spleen, or abdominal tumours, or with obstruction of the vena cava from enlargement of the retro-peritoneal glands. As regards what I have called simple dropsy, very little is known about it, save the fact that ascites sometimes comes and goes without any definite cause. Some think that exposure will lead to it; others, that it may be due to anæmia or malarial poisoning. Barthez and Sanné speak of a primary and secondary form—the former a disease of little intensity, the latter of two kinds, one acute, and it seems to me indistinguishable from peritonitis, the other chronic or cachectic. I doubt if these distinctions serve any useful purpose. Ascites with acute symptoms would resemble subacute peritonitis, and would raise similar questions as regards its cause. We should in any such case require to discuss the possible existence of tubercle; of other exciting causes of which there might be a hint or not in the particular case; and probably, in the event of the recovery of the patient, add to our own uncertainty of the nature of the case by the mental reservation that it may have been simple, idiopathic, or without any referable cause. The two remaining groups boast very similar symptoms: the children affected are mostly of six to ten years of age; they are spare or flabby, although not in any marked manner cachectic; there may or may not be a mild pyrexia. In one or two the fluid has been associated with lumps which have suggested the possibility of the existence of a caseous omentum or some chronic inflammatory thickening.

There is yet another condition in which ascites may be the prominent symptom. It has been described as "**adhesive mediastinitis.**" We have seen instances of this rare condition: children in whom the abdomen had gradually become distended by ascites for which there was no apparent cause. On careful examination, however, the veins in the neck are seen to be full and the heart-sounds are noticed to be muffled; there is no evidence whatever of endocarditis or rheumatism, but the area of cardiac dulness is larger than normal, and the liver may be considerably enlarged.

Such cases sometimes go on for years; the ascites may diminish with rest in bed or under medicinal treatment, or it may require repeated tapping. Post mortem the pericardium is found to be completely adherent, and probably the inflammation has extended to the tissues of the mediastinum. In some at least of these cases the pericardial adhesions are tubercular in origin; in others the pathology of the condition is uncertain.

Diagnosis.—Ovarian tumours rarely occur in childhood; but one of this nature may easily be mistaken. Hydronephrosis might also lead to mistake, and large hydatid tumours in the liver or elsewhere. But perhaps the most likely to resemble it is the large pendulous abdomen seen in some rachitic children or those with long-standing mucous disease. The enlargement is remarkable in some of these cases, and, when the child is erect, prominent; but lying in bed, and the parts being flaccid, much of the protuberance subsides, to be replaced by lateral bulgings like the belly of a frog. A perfect undulation may be obtained from an abdomen of this sort unless care be taken to steady the flaccid walls. The note on percussion is often somewhat dull, and, unless the flanks be carefully examined in different positions, a mistake is by no means difficult, even to a practised hand.

Treatment.—This must depend upon the cause; but perhaps the most important points to bear in mind are the necessity of reducing the quantity of fluids given to the child; and of giving iron in cases where the disease appears to be idiopathic. The iron may be given as the iodide or the saccharated carbonate, and diuretics (in addition to copious imbibition) can be given as well (F. 39). The resin of copaiba seems to be exceptionally useful in adults in cases where there is a healthy kidney; but I have not tried it much in children, although there is no reason against its use save the taste. Digitalis and squill can be made more palatable; and, again, a local application of oleate of mercury or mercurial ointment to the abdomen is of value.

If the fluid does not diminish after a good trial, paracentesis should be performed. This operation is not only palliative, but it is a *remedial* agent of great value. I prefer the use of a very fine cannula, such as that called a Southey's tube, though of rather larger bore and considerably longer. A drainage-tube is attached to this, the cannula is left *in situ*, and the fluid allowed to drain away for some six or eight hours. The abdomen should be carefully bandaged the while, and continuous pressure must be kept up afterwards. The fluid is not all removed by this means, but enough is withdrawn to relieve pressure and the better to allow of absorption of what remains. Moreover, the operation of paracentesis on this plan is so slight that the child is hardly frightened by it, and it can be repeated in like manner when necessary.

CHAPTER XXXI.

BLOOD DISEASES: DISEASES OF THE SPLEEN.

THE blood in infancy and childhood presents certain differences from the adult condition. In the newborn infant the percentage of hæmoglobin is high; according to Hutchison,* it is as much as 110 per cent.; the red corpuscles also are more numerous, amounting to six millions per cubic millimetre. The latter, however, fall to the adult number, five millions, by the second week, and continue thereabouts throughout the whole period of childhood. The hæmoglobin falls more gradually, reaching about 70 per cent. at the sixth month: it remains at this low percentage until the child is about six years old.

The number of white cells is higher in the infant and young child than in older children and adults. At the age of six months, according to Hutchison, it is 15,000 per cubic millimetre; from that time it gradually diminishes to about 11,000 at two years, 10,000 at three years, and about the sixth year the adult figure of about 6000 is reached.

As regards the different kinds of white corpuscles the most striking peculiarity is the large proportion of lymphocytes during the first three or four years of life. Shortly after birth the proportion reaches 45–50 per cent., and remains as high as this for the first two years of life: it then gradually falls to about 30 per cent. at the age of four years, and remains about this level throughout the rest of childhood.

The polynuclear leucocytes, the granular cells, on the contrary, are in lower proportion during the first four years of life than in later childhood: from 36 per cent. at the end of the first week,

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* For much of the information in this chapter we are indebted to Dr. Hutchison's Goulstonian lectures on the Blood Disorders of Childhood. *Lancet*, March 1904.

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they increase only slowly to about 45 per cent. at two years, and 60 per cent. at four years.

Of other white cells, transitional forms, large mononuclear cells and eosinophile cells, there is not much to be said; after the first week of life they are present in about the same proportions as in adults.

Anæmia.—Anæmia is a common ailment in childhood: it occurs at all ages, from a few months old upwards. In the majority of cases it is symptomatic, the so-called secondary anæmia, but often it is no easy matter to determine the cause which underlies it. During the first two or three years of life, rickets and syphilis are common causes for more or less severe anæmia. Naturally enough, poorness of blood is associated with all sorts of diseases, sometimes in the acute stage, as for instance, in malaria or in rheumatism, where marked diminution of hæmoglobin is often observed, or as a sequel to any acute disease —for instance, after specific fevers or pneumonia, and commonly as the result of chronic disease, whether tubercular or otherwise. It is a frequent indication also of deficient absorption of food, whether from insufficient supply of the needful constituents, particularly of iron-containing food, or from some disorder of digestion. Occasionally, in children, worms, especially tapeworms, are productive of much anæmia.

In other cases, again, the cause lies in defective hygiene, insufficient fresh air and insufficient exercise; or, as the saying is, the child may have "outgrown its strength," a popular version of a physiological fact which undoubtedly accounts for some of the cases of anæmia; the framework of the building has increased more rapidly than the manufacture of material for its upkeep.

Symptoms.—Anæmia of this secondary type is little more than a symptom itself, and hardly requires consideration under this head, apart from the causes on which it depends: but we may point out that in infancy and in early childhood anæmia of any sort, whether "secondary" or "primary," is frequently associated with some degree of enlargement of the spleen; a point of some importance as it has been thought that on this clinical feature some stress might be laid in the differentiation of particular forms of anæmia: in our opinion, however, its significance is too uncertain, and the conditions under which it occurs are too various, to allow of any great stress being laid upon this enlargement as marking off one form of anæmia from another.

Anæmia of any kind is apt to be associated with constipation, sometimes with much sweating, and generally with some degree of lassitude. In some cases, particularly where rickets or syphilis underlies the poverty of the blood, the anæmia becomes profound, and there is a waxy white or yellowish pallor, and a bloodlessness of the mucous membranes which may well make us guarded in prognosis. Hæmic bruits are heard over the heart, and a "bruit de diable" over the jugular veins in the neck. In children as in adults with anæmia, the changes in the blood vary considerably. In general it may be said that there is diminution of hæmoglobin and of the red cells, and if the anæmia is at all severe, there is often slight increase of the white cells. In some cases, Dr. Hutchison thinks, especially in infants, and also in cases where the anæmia is associated with chronic gastro-intestinal disturbance, there is an exaggeration of the normal excess of lymphocytes; with acute complications—for instance, broncho-pneumonia—there may be increase of the polynuclear leucocytes. With severe anæmia of this symptomatic variety, myelocytes are sometimes present; the red cells also show much variation in shape and size, and nucleated red cells may be numerous. At present the significance of these various blood changes is very uncertain, and although they may give some indication of the intensity of the blood change beyond what can be learnt from the appearance of the child, they do not otherwise affect prognosis.

Prognosis is almost always good in this symptomatic anæmia. Sometimes, especially in the profound anæmia which is seen with rickets or with syphilis, improvement may be slow, and recovery may occur only after many months of treatment; but apart from the occurrence of complications recovery is the rule.

Treatment.—The difficulty lies in getting at what is wrong: too often it is considered sufficient to give a tonic, chiefly iron, and this almost without inquiry. But before resorting to drugs, investigation must be made of the personal hygiene of the child—its disposition, its food, its sleep, its clothes, its habits, its play, its work, its house, and its environs, &c. Not till all these things have been considered can it be determined whether the requisite treatment should be by aperients, quinine, iron, arsenic or cod-liver oil, or by more food, more air, less work, and so on. (F. 23, 32, 44, 36, 17.) The rachitic cases do well with beef juice or raw meat, and the syrup of the lactophosphate of iron in half-drachm doses. For the syphilitic cases, mercury must be given, in addition to a mixture of cod-liver oil and iron.

Primary Anæmia hardly occurs in childhood if under that term be included only chlorosis and pernicious anæmia. As has been already pointed out, deficiency of hæmoglobin is a normal condition in early childhood, and this deficiency is easily aggravated by slight causes, occasionally without any corresponding decrease in the number of red corpuscles: but it is doubtful whether such a condition ever occurs in children, except as a secondary phenomenon in other disorders: an idiopathic condition like the chlorosis of young adults rarely if ever occurs in childhood.

"Pernicious anæmia" also has but rarely been observed in children. Hutchison was able to collect eleven recorded cases, but six of these were of doubtful nature. The youngest of the five which seemed to correspond to the disease as known in adults was aged nine months, the others were between five and eleven years old. In these cases, as in the disease in adults, profound and progressive anæmia with lemon-yellow colour of the skin, with retinal and other hæmorrhages, and sometimes with general œdema, terminated fatally after several months. The chief features in the blood were the great diminution of red cells, in one case to 800,000, in another to 295,000 per cubic millimetre, some increase of white cells, and much poikilocytosis. We doubt, however, whether the blood examination alone would justify the separation of these cases from the severe degrees of secondary anæmia, in which very similar changes have, in our experience, occurred in the blood, and in which, nevertheless, recovery occurs. The distinction seems rather to rest upon the clinical course, and even this is but a hazardous distinction, for occasionally a markedly lemon-yellow tint occurs in what is certainly a secondary anæmia, and we have even seen retinal hæmorrhage in a child with severe secondary anæmia which recovered.

The important fact, however, remains that some cases of anæmia in children arise without obvious cause, run a progressive course and end fatally.

Splenic Anæmia (Pseudo-leukæmia of infants).—This name has been given to a group of symptoms which are sufficiently definite and constant to require a separate description: they consist essentially of enlargement of the spleen, with earthy pallor and certain changes in the blood, which are different from those of leucocythæmia.

When one comes, however, to consider the question whether in the so-called "splenic anæmia" we have to deal with a disease *sui generis*, or whether by this name we mean a series of symptoms which may be the result of more than one disease, it is not easy to give an answer. In some of the cases of splenic anæmia rickets is present, in a certain proportion there is more or less evidence of syphilis, and in a good many the head shows well-marked bosses (Parrot's nodes) on the parietal and frontal bones, which, according to the bias of the individual observer, may be interpreted as evidence of rickets or of syphilis; while in others again there is no suspicion whatever of syphilis or of rickets. Moreover the blood changes, though always considerable, are not, so far as our experience goes, constant in their character, and as will be seen from the description of these below, there is certainly in some of the cases nothing sufficiently characteristic to justify a distinction on blood-changes alone between splenic anæmia and any secondary anæmia of severe degree. And, lastly, in its morbid anatomy there is nothing sufficiently distinctive to enable us to separate splenic anæmia sharply from other diseases in which there is chronic enlargement of the spleen.

From what has been already said it will be evident that of the ætiology of splenic anæmia we know practically nothing. It is a disease of infancy, and is not very rare; it occurs most commonly between the ages of six months and eighteen months; it has been noticed several times in twin children, in one or both: as already mentioned, it keeps company almost always with rickets, not uncommonly with syphilis.

Symptoms.—The onset is insidious with pallor often of a peculiar earthy type; the enlargement of the spleen appears simultaneously, and is often so great as to attract the mother's attention; the lower edge of the spleen will extend downwards, perhaps to Poupart's ligament, and forwards beyond the middle line: the spleen is very firm. In some cases the liver can be felt about an inch below the costal margin, but seldom more. The lymphatic glands usually show no enlargement. As a rule these infants are ill-nourished, and as the disease progresses sometimes become considerably wasted. The examination of the blood shows usually a moderate degree of leucocytosis, with diminution of the red corpuscles and hæmoglobin. The diminution of the red corpuscles is seldom extreme, it may even be quite moderate, perhaps not below 3,500,000 per cubic millimetre in cases in which the spleen reaches well below the umbilicus. The hæmoglobin is often diminished to a greater degree than are the red cells. Nucleated red cells are usually present, but are neither constant nor characteristic, they are common in any severe anæmia in childhood. Poikilocytosis also —that is, variation in the shape and size of the red corpuscles— although frequent, is a very variable feature. Increase of white cells is not constant, in some cases the number is even below the normal for the age. Usually, however, there is some increase of leucocytes, chiefly of the lymphocytes, the number of large lymphocytes, large mononuclear and intermediate sizes between these and the small lymphocytes is increased, and, according to Dr. Hutchison, this polymorphism of the leucocytes is the most characteristic feature of the blood in splenic anæmia. The proportion of polynuclear cells is seldom increased.

Prognosis.—The course of these cases is usually slow. The spleen may vary in size from day to day, and under suitable treatment may decrease considerably for a time, only to enlarge again later. Usually after some months the anæmia becomes more profound, purpura appears, and perhaps the onset of diarrhœa ends the scene. But the outlook is not always so gloomy, temporary improvement often occurs, and quite an appreciable number of cases recover completely.

Morbid Anatomy.—Beyond the enlargement of the spleen there are no constant post-mortem appearances. The spleen is enormously enlarged and very firm, but on section it shows no definite alteration in structure. There are none of the changes which characterise leucocythæmia in the viscera. The liver in some cases has shown a slight excess of fibrous tissue, intercellular in distribution, which might be taken as evidence of syphilitic taint; but even with such an association there may be no proof of syphilis in the clinical history. Subserous and submucous hæmorrhages may be present, as in any form of anæmia.

Treatment.—In the treatment of splenic anæmia, good results have been obtained both with mercury administered internally and with cod-liver oil. We have also seen recovery occur with the use of bone-marrow, which may be given in the form of the glycerin extract, in doses of 20–30 minims. Arsenic has also caused improvement, it may be used in doses of a half to one minim for an infant of nine months old. One may venture to suspect that given a certain duration of the morbid condition, changes take place in the circulation through the spleen which make a rapid return to normal impossible, and it therefore seems advisable to take to external aid, such as gentle friction over the surface of the organ by oil or soap liniment, in addition to other means, for, although no striking success can be hoped for, some little good may possibly be gained.

Leucocythæmia, or leukæmia as it is now usually called, is extremely rare in childhood. There are two varieties of leukæmia, both characterised by large excess of the white corpuscles in the blood, but differing in the character of these corpuscles; in the myelogenous form there is predominance of the granular cells, polynuclear leucocytes and myelocytes, which have their origin in the bone-marrow, whilst in lymphatic leukæmia there is great excess of the lymphocytes or non-granular cells, which are formed chiefly in the lymph glands and other lymphoid tissues of the body.

In children the myelogenous variety of leukæmia is excessively rare, very few cases have been observed; lymphatic leukæmia, although rare indeed, is the form generally met with in childhood.

The symptoms do not differ from those seen in adults. There is the enormous spleen, the moderate enlargement of the liver, the anæmia, and the tendency to hæmorrhages. In the lymphatic form, the lymphatic glands are enlarged more or less in nearly half the cases, but rarely to the marked degree which is seen in Hodgkin's disease. The temperature is usually irregular, we have seen it rise to 105° without apparent complication. Optic neuritis and retinal hæmorrhages may be present. The blood shows great excess of leucocytes, so that the proportion of white to red corpuscles may be in the earlier stages of the disease 1 to 30, and in the later stages 1 to 3 : the red cells are also greatly diminished, perhaps to 1,000,000 per cubic millimetre or even lower. The contrast between the findings in the blood in the two forms of leukæmia may be seen from the following comparison : (1) myelogenous leukæmia : girl aged four years and eleven months, liver and glands not palpable, spleen enormous. Red cells, 2,425,000 ; white cells, 1,590,800 ; hæmoglobin, 25 per cent. Of the white cells, myelocytes, 60 per cent. ; polynuclear leucocytes, 30 per cent. ; eosinophile myelocytes, 9 per cent. ; lymphocytes, 7 per cent. (Hutchison). (2) Lymphatic leukæmia : boy aged thirteen years, spleen and liver slightly enlarged, glands enlarged everywhere. Red cells, 2,000,000 ; white cells, 240,000 ; hæmoglobin, 40 per cent. Of the white cells, lymphocytes, 98·7 per cent. ; polynuclear leucocytes, 1·2 per cent. ; only occasional myelocytes and eosinophile cells (Hutchison). With these may be contrasted the normal blood-count for a child about six years old : Red cells, 5,000,000 ; white cells, 7500 ; hæmoglobin, 80 per cent. Of the white cells, polynuclear leucocytes, 60 per cent. ; lymphocytes, 30 per cent. ; transitional and large mononuclear, 8 per cent. ; eosinophile cells, 2–3 per cent. ; no myelocytes.

The diagnosis of leukæmia can only be made by an examination of the blood. It must be distinguished especially from splenic anæmia, a much commoner disease, in which increase of leucocytes is usually much less and which scarcely occurs beyond the age of infancy. The morbid anatomy of leukæmia in childhood would seem to differ in no way from that seen in adults—there is the same enlargement of spleen, liver and kidneys, the same dense leucocytic infiltration of viscera and glands, and the same occurrence of superficial and deep hæmorrhages in the organs.

The prognosis is bad : we have seen a fatal result within a few weeks after the onset of symptoms, but more often the case lingers several months.

Treatment consists in the administration of arsenic, which should be given in doses of one to five minims according to the age, but well diluted, for in this as in other severe anæmias there is often a tendency to gastro-intestinal disturbance on slight provocation. The preparations of bone-marrow are also worthy of trial : half a drachm of the glycerin extract of red bone-marrow may be given three times a day and increased later to a drachm dose. Virol also may be of value in these cases. Faradism applied over the enlarged spleen has been tried, and may possibly have some beneficial effect. If iron is used the milder preparations, such as the ferrum redactum or tartaratum, or the liquor ferri peptonati (half a drachm to two drachms) should be used.

Splenic Enlargement.—Apart from the extreme enlargement of the spleen which occurs in splenic anæmia, leukæmia, and sometimes in Hodgkin's disease, splenic enlargement usually of a slighter degree is a very common affection in children.

It occurs for the most part in those who are under three years of age, the majority of them being but a year or eighteen months old, and is generally due to one or other of the following conditions—rickets, syphilis, tubercle, typhoid fever, malaria, or to some cause unknown. Lardaceous disease is found in children, and cirrhosis of the liver is usually associated with some splenic swelling; but in all these the one change, being coupled with others which have general symptoms of more prominent kind, is of less importance, and the description of the same form of disease in the adult will apply to that in the child. The symptoms of lardaceous disease and of cirrhosis of the liver are sufficiently distinctive. In the affections enumerated above the spleen may be the only part to attract attention, over and above the pallor that exists. As regards the frequency of the various forms of enlargement, of seventy-four cases of which I have notes, twenty were associated with well-marked rickets; in twenty-four others the rickets was very little indeed, or none at all, and the disease could not in these cases be with certainty attributed to this or indeed to any other cause—some may have been due to pulmonary obstruction, some, perhaps, to malaria; fourteen were in syphilitic children; in ten it was a part of a general tuberculosis. Of the remainder two were febrile cases, three leukæmic, and one the result of malaria. The enlargement which is due to typhoid fever finds so scarce a mention because it has its appropriate place under the disease to which it belongs.

In almost all the conditions mentioned above the enlargement of the spleen is merely a symptom of the disease in which it occurs, and as such can hardly be said to have any symptoms of its own.

Nor are there any special points by which the splenic enlargement of one disease may be distinguished from that of another. The various causes I have enumerated must be kept in mind, and other symptoms of the special disease examined for. I have, however, thought in the two diseases which are so difficult to distinguish from one another, typhoid fever and acute tuberculosis, that the spleen of the one could sometimes be distinguished as *soft*, and that of the other as *hard*. It may also be said that the tubercular and the syphilitic spleen are both more often associated with enlargement of the liver than are rachitic and simple chronic enlargement of the spleen.

Morbid Anatomy.—Rachitic and simple chronic enlargements usually show similar appearances. The spleen is large, its capsule perhaps a little thick, its substance firm, pale or dark-coloured, and under the microscope the fibrous septa of the organ are thickened. Dr. Dickinson has made a valuable contribution to the histology of the rachitic spleen, and considers the disease to be a fibrosis. I have seen hyaline thickenings of the septa which might be called fibrotic in four cases which I have examined. As is well known, an albuminoid change has been described by Sir W. Jenner as peculiar to rickets, but this can only occur in the more extreme cases, and it is decidedly uncommon. I have never seen it, and Dr. Gee only occasionally.

There is hardly enough evidence at hand to prove what are the precise changes which a syphilitic spleen undergoes, but its coarse appearances are usually such as are seen in simple chronic enlargement. Very rarely gummata have been found in its substance. The tubercular spleen has, scattered over the surface of its capsule, many large juicy-looking grey miliary tubercles; and similar bodies are spread thickly through its substance. Either on the capsule or in its substance, but particularly the latter, the tubercles are often caseous and appear as small yellow grains.

Prognosis.—All splenic enlargements are liable to prove intractable. Even those of syphilitic origin, which might be expected to answer readily to drugs, respond but tardily in comparison with other viscera. It is a common thing to find the liver decreasing rapidly in size, while the spleen has altered but little. As a rule, they slowly improve in the course of months.

CHAPTER XXXII.

DISEASES OF THE LIVER.

THERE is not much to be said on this head. The liver is not an organ which is frequently diseased in childhood, though perhaps there is no one of the hepatic diseases of adult life which may not, as an occasional thing, find a home or have its birth there.

The most common affection would seem to be simple jaundice, which may be found at any age—at birth, when it is called "icterus neonatorum"; and in older children, when it may be due to a variety of causes, but is, perhaps, chiefly "catarrhal."

Icterus Neonatorum is of two forms, physiological and morbid. In the one case it is merely a yellowness, due to changes which ensue in a congested skin at the time of, or soon after, birth. It is said to be more frequent in premature infants. In this case, the conjunctiva and urine remain free from colour, and the fæces retain a natural appearance. It passes off within a few days, and is not of any moment. It requires no treatment.

Icterus due to disease is a more serious matter, but the outlook will depend greatly upon the nature of the cause of the jaundice. In some cases it appears to be due to a simple catarrh of the ducts, to some defective circulation in the liver in the first few days of life, or to exposure to cold, it being particularly frequent in foundlings. This kind may be expected to pass off within a few days by warmth, and some gentle laxative, such as hyd. c. cret. or castor oil. But in other cases it is due to some congenital malformation, some syphilitic thickening of the ducts, or to some inflammatory or phlebitic affection of pyæmic origin, which has started in the umbilical sore. Such things lead almost inevitably to death, and in no long time;

but cases are on record in which children have lived for some weeks, or even months, with such serious malformations as absence or obliteration of the common duct; * one case which we examined post mortem had lived to the age of nine and a half months. Jaundice is not necessarily present at birth; in such cases the appearance of the jaundice has sometimes been delayed for several days, and even for more than a fortnight after birth; in one of our cases jaundice had not appeared until three weeks after birth, although the autopsy showed that the gall-bladder and ducts were entirely absent, being represented only by fibrous tissue. Death usually results from hæmorrhage from the umbilicus, or from a more gradual wasting and exhaustion. Diseases of this kind hardly admit of treatment.

Catarrhal Jaundice.—In children beyond the age of infancy, jaundice is usually a temporary condition, and is thought to be due to catarrh of the ducts. In our experience this would seem to be most common between the ages of two and six years. It is apparently sometimes due to great emotional excitement. Almost always the child has been ailing for some days before the jaundice appears, feeling languid and sometimes drowsy. Often the child is cross and fretful, the appetite is bad, and almost invariably there is something abnormal in the state of the bowels: in some there has been diarrhœa, in others constipation, in others only offensive stools. Vomiting commonly precedes or accompanies the onset of the jaundice. The urine quickly becomes darkened and the fæces pale. Pain in the epigastrium or right hypochondrium may be a marked symptom. The liver is often slightly enlarged and tender. The temperature is raised, 101° or 102°. The jaundice is not usually very deep; indeed, we have seen cases in which it was so slight in the skin that it might easily have been overlooked if the conjunctiva, where the yellow colour is more obvious, had not been examined. This catarrhal jaundice in children usually passes off in about ten days or a fortnight; but we have seen cases in which it lasted for several weeks.

A recurrence of jaundice at short intervals is sometimes observed. For example, a girl aged about three years had an attack of jaundice, apparently catarrhal in origin; it lasted fourteen days, then the child remained well for six weeks, after which another attack came on and lasted a fortnight. Some mild laxative, such as the compound decoction of aloes, a little liquorice powder, syrup of rhubarb, or fluid magnesia, is the only remedy that is requisite if the diet be restricted.

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* Dr. John Thomson has given an excellent account of this condition in his work on "Congenital Obliteration of the Bile Ducts," Edinburgh, 1892. Two of the cases there collected lived nearly eight months.

In a case of jaundice, where the child has fever or vomiting, it is well to remember that icterus sometimes follows suppuration in the branches of the portal vein (pylephlebitis) or masked disease about the cæcum or elsewhere, and that such other things as acute yellow atrophy, enlargement of the mesenteric and lumbar glands, &c., may exist, and give rise to the symptoms. I have also several times seen acute tuberculosis give rise to considerable enlargement of the liver and moderate jaundice.

Of hydatid disease, lardaceous disease, and fatty degeneration, I shall say nothing, for they present no special peculiarities in childhood; nor of cancer (sarcoma) of the liver need more be said than that when it occurs, which is very rarely, the growth is usually soft, lobulated, and very rapid in its spread. It is less common than sarcoma of the kidney. I have seen five of the latter to one of the former.

Biliary calculi are almost unknown in children; but cases have been observed, and they appear to be less rare in infancy than in later childhood: of twenty-three collected cases,* including three which came under our own observation, fifteen were in infants, and fourteen of these were under ten months of age. In several of these there was intense jaundice at birth or shortly afterwards, and calculi were found in the ducts.

The **albuminoid** disease of rickets will receive sufficient notice in the article on Rickets.

Tubercular Disease requires mention, because it may cause considerable enlargement of the liver, which, except for this knowledge, may prove inexplicable, or more probably be attributed to quite a wrong cause. I have seen such a case, which was supposed to be cancer, but the diagnosis of tubercle was proved to be correct by the post-mortem examination. The disease in the lung may be quite latent till towards the close. The liver may show either of two appearances, or the two more

* *Path. Soc. Trans.*, vol. l.

or less combined. There may be yellow caseous softening masses scattered through the liver, which are tubercular growths around the smaller bile-ducts; in a more advanced stage these sometimes give rise to cyst-like cavities varying in size from a pin's head up to a large pea, and containing fluid which may closely resemble viscid bile or be more opaque; the walls of these cavities are sometimes smooth and sharply defined externally by a fibrous layer. In other cases there is an extensive miliary tuberculosis of the organ, in which the texture is irregularly stuffed with the lymphoid tissue; some parts being congested, and some fatty; and the *tout ensemble* showing a large mottled, sometimes nutmeg-like liver. Jaundice may be found in either variety, but is a somewhat rare symptom.

Cirrhosis of the Liver is found in all respects like that of adults, even to the wrinkled *blasé* appearance of the face, with its well-known congestion of the small vessels of the cheeks. Its chief interest, perhaps, centres round the discussion of its cause; some having contended that in children it is not due to alcohol, and that some additional light is thus thrown upon the pathology of the disease in adults. There is no space here to be more than dogmatic, and I must content myself by saying that even in children some of the recorded cases have been due to alcoholism; and that in others there has been no sufficient disproof of the possibility of such an exciting cause. As Gerhardt says, alcoholism in childhood is very difficult to prove. It is probable, however, that it is not by any means the sole cause of infantile cirrhosis, though what the other causes may be we at present know but little.* It is not unlikely, however, that some cases may be explained by congenital syphilis, and others by changes, either congenital or commencing in early infancy, of a very chronic hyperplastic character around the ducts or veins. Ague and phthisis have also been found associated with it, and Dr. William Pepper, of Philadelphia, has reported a case in a child of eight years in which it followed *measles*, a catarrhal jaundice coming on during the exanthem.† This case is of much interest, because it coincides with observations made within the last few years, and of which I will specially mention some by the late Dr. Crooke, which show that in some of the exanthemata cirrhotic changes do originate in the liver, and it is probable that some of the cases of advanced cirrhosis, which come under notice without any history of alcoholism, may have started in this way—it is at any rate likely enough. Cirrhosis of the liver is not a disease of infancy ; a very few cases are on record in the new-born, and in some of these it appears to be part of a congenital malformation of the liver, as in the cases of congenital obliteration of bile-ducts mentioned above, and in some cases of congenital cystic disease of the liver. It may occur at any period of infancy from syphilitic disease, but it is most common at the age of about seven or eight years. In the majority the early history has been wanting and the onset exceedingly obscure.

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* See a paper by Dr. J. Mitchell Clarke, *Brit. Med. Journ.*, vol. i. 1894.

† *Lancet*, 1887, vol. ii. p. 226.

Morbid Anatomy.—In most of the cases the liver has been markedly granular and fibrous throughout ; in some there has been extensive scarring, and consequent distortion, so as to give some colour to the idea that syphilis has been at work. The histological changes have been mostly those attending the more chronic forms of the disease—that is to say, more fibrous than cellular. The earlier stages, of enlargement of the viscus and new growth of cell elements have been described as in adults, and no doubt occur, but are likely to escape notice until the onset of ascites.

The **symptoms** are for the most part a precise reproduction of those which occur in adults ; perhaps it may be said that splenic enlargement is more constant than in the adult, and that diarrhœa is more prominent. Ascites has been extensive without much jaundice in most of the cases I have seen. The striking feature in many of these cases is the great enlargement of the spleen, and given a child with slight jaundice, a very large spleen, and a tendency to epistaxis or other hæmorrhage, one has sufficient grounds for suspecting the existence of cirrhosis.

As regards prognosis it is probable that these cases preserve some measure of health for a long time ; at any rate, a fatal result does not occur usually for two or three years after they come under notice, and although it may well be supposed that this is the invariable termination of such cases, the actual facts are difficult to ascertain.

Treatment consists chiefly in dealing with symptoms as they arise ; but the alcoholic origin of the disease in some cases must be remembered, and the cause removed if it is still present.

Syphilitic Hepatitis may be of three kinds. The liver may be subject to acute swelling, which, without showing very much change to the naked eye, is associated with a diffused cell-growth throughout the organ, either scattered or gathered into miliary gummata ; there may be a localised gummatous change here and there, as in adults ; or, as in a case recorded by Barlow, scars of retrocedent gummata ; or there may be a nodular or streaky affection of the septa—a peri-pylephlebitis syphilitica.

In any case there may be adhesions about the capsule of the organ.

All these changes are chiefly met with in the full-time or premature fœtus, or in the first few weeks of life. But they are not limited to this period ; we have occasionally seen children up to the age of eight or nine years the subjects of congenital syphilis, whose liver on palpation showed large superficial bosses, which disappeared rapidly under antisyphilitic treatment, and were almost certainly gummata. Cicatrices or a diffused swelling appear to be the commoner forms of the disease. Sir Samuel Wilks has recorded a case of the latter kind in an infant of four weeks old,* and Gubler, V. Baerensprung, and Wagner have gone carefully into the subject, but there are not many complete cases on record. The liver is enlarged, hard, and elastic, creaking under the scalpel, and torn with difficulty ; it is often pale or mottled.

In the few cases that I have seen, the microscopical characters of the disease have been remarkable for the extreme degree of cell-growth that has occurred, so much so that it has been difficult, if not impossible, to give an opinion upon the mode of invasion which the disease has pursued. The hepatic cells were inextricably mingled with those of the syphilitic growth, nearly all trace of the natural structure having been lost. This condition is not unimportant in regard to the subsequent occurrence of cirrhosis. It would seem to be one that, if not fatal in itself, is pre-eminently likely to produce a subsequent cirrhosis ; and no doubt it is one of the facts upon which those may rest who consider that the cirrhosis of older children is in some cases due to syphilis. The spleen is often enlarged as well as the liver.

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* *Trans. Path. Soc. of London*, vol. xvii. p. 167.

Symptoms.—The liver may be much enlarged and hard. There may be ascites and some amount of jaundice. The following case will illustrate these points:

A male infant, aged two months, was brought to the hospital for enlargement of the abdomen, which was much distended and shiny, and the veins in the wall large and full. The abdomen had been gradually enlarging since a fortnight after birth. The liver was much enlarged and bossy, extending half way to the umbilicus, its edges being sharp and well defined. The spleen was very large also.

The child was much wasted and pale, its mouth wrinkled, but there was no other trace of syphilitic eruption in any part of the body.

It was treated by a grain of hyd. c. cret. night and morning, and quickly improved, gaining flesh rapidly, and the liver and spleen, the liver particularly, diminishing much in size. The child was under treatment, on and off, for four years for various ailments, an attack of snuffles amongst them, and remained quite well as regards its liver and spleen. During this time another infant was born, and this was under treatment for well-marked congenital syphilis.

Diagnosis.—There can hardly be any mistake. Setting aside the fact that enlargements of the liver and spleen at this early age are rare, except in syphilis, there are the recognised symptoms in the parent, and in the child itself, which should in most cases clear up any doubt.

Prognosis.—Steiner remarks that in syphilitic hepatitis it is generally unfavourable; but such has not been my experience. From some eight or ten cases they seem to be remarkably amenable to mercurial treatment, as was the case just detailed. Under mercurials the liver will rapidly diminish; the spleen is, as I have already said, less easily acted upon.

Treatment.—A grain of hyd. c. cret. may be given every night, or night and morning, for two or three weeks, or longer if necessary, and some syrup of the iodide of iron may be added later.

Simple Enlargement.—In addition to these various forms of enlargement may be added another of which nothing definite can be said, and which probably includes cases of very different origin. Some may be due to pulmonary congestion, some to intra-hepatic conditions, which may be called congestive failing any certain knowledge of their nature, but which embrace not only circulatory states, but conditions of storage also of such elements as bile and fat. It is probable, too, that spleen and liver go together in this respect, and as in the one case so in the other there are causes dietetic or hygienic of which we in fact know little. Dr. Donkin alludes to a simple chronic enlargement associated with ascites, of which, now that he has described it, I remember to have seen a few cases. Some of these may possibly be brought about by some plastic inflammation above the liver, such as the mediastinitis to which allusion has been made on p. 446, but the nature of these cases is at present obscure, and very likely individual cases own different origins.

Functional Disease.—Far more frequent than cases of organic disease are instances of what is popularly termed "sluggish liver"—children whose bowels are habitually confined and the evacuations pale and deficient in bile. Thus, in effect, says Dr. West,* whose description is so precise that it seems unadvisable to do otherwise than quote him, "without being positively ill, children thus affected are usually sallow and look out of health; their appetite is variable, and their tongue never quite clean." And, as related to these, Dr. West alludes to older children who, with good health and regular habits, yet every few weeks or months have a bilious attack with severe headache. Of the nature of these last cases there may well be a doubt. Many would be inclined to consider them less as hepatic diseases than as illustrations of megrim or some allied disorder. But the former class are less equivocal: the habits are irregular, the excreta pale, the tongue furred, and the breath foul, and attention to the bowels and the functions of the liver mends matters considerably.

Treatment.—In this condition euonymin is a good remedy—a quarter to half a grain with some white sugar once or twice a day. If the bowels do not act, the euonymin may be given with some cascara sagrada, or the compound decoction of aloes, or sulphate of magnesia, with the compound infusion of roses.

* "Diseases of Children," 5th edit. p. 60.

Nux vomica, hydrochloric and phosphoric acid are also useful in these cases.

Lithæmia.—Other cases, which may also be called hepatic, give evidence of disturbances which are chiefly urinary. A child, perhaps of three or four years old, becomes fretful. It may seem pretty well, but perhaps suddenly, and frequently, will cry, quickly recovering itself and resuming its play. With this disturbed mental equilibrium there is frequent micturition, and the urine deposits the red sand of uric acid or a thick pink sediment of urates. This is the condition which in older people, and with more variety of symptoms, Dr. Murchison denominated "lithæmia." It is often associated with irregularity of bowels.

Treatment.—Hitherto I have disseminated what is, I believe, still the orthodox opinion, that the excretion of uric acid in excess is to be arrested by a greater abstemiousness of living, particularly in the matter of red meat. However true this may be for the declining, I have not been satisfied with the results of this advice for what may be called the ascending decades of life; and although, no doubt, the condition is the result of some mal-assimilation which may in some measure be corrected by modifications of diet, I believe the passage of sand in the urine more often owes its being to an undue proportion of the farinaceous elements of diet, and possibly to the consumption of too little soft water, than to any excess of animal food. Consequently it is to such articles that I now chiefly direct attention and inquiry. In the voracious and the food-bolter it may be well to temporarily replace meat by lighter articles, such as fish and fowl, and these children should at all times be made to take their meals more slowly. With many it is advisable to increase the meat and lessen the bread, the milk-puddings, the porridge. The medicinal treatment resolves itself into a little effervescing citrate of magnesia twice or three times a day; a little bicarbonate of potash at bedtime; and afterwards a little euonymin taken once a day, or a tea- or dessert-spoonful of compound decoction of aloes three times a day.

But having thus far offered sacrifice in some measure to orthodoxy, I would add, for the relief of my own conscience, that I cannot understand how it is that we still go on preaching the exclusive doctrine that the excretion of uric acid in excess is, under any circumstances, solely a dietetic result. Of the two I would much rather maintain it was altogether independent of diet, so largely is it due, for any one who can approach the subject from the side of clinical observation with an unprejudiced mind, to constitutional tendencies on the part of the individual.

CHAPTER XXXIII.

DISEASES OF THE GENITO-URINARY ORGANS.

THE urine in childhood differs in some respects from that of adult life, and it is important that these differences should be recognised in order that they may not be mistaken for indications of disease.

In infancy, after the first few days of life, the urine is usually very pale, sometimes almost colourless, and the specific gravity is correspondingly low; it may be 1002 or 1004. The percentage of urea is much lower than in older children, it is often less than 1 per cent.

The total amount of urine passed daily is, however, much greater relatively to the weight of the child than it is after the second year. It is seldom possible to determine the actual amount of urine in infancy. Dr. Emmett Holt states that the average daily quantity from the second to the sixth month is 7–16 oz., and from this time to the end of the second year 8–10 oz.

After the end of the second year the ratio is much smaller. From some observations which we have collected, it would seem that for practical purposes the average daily amount between the ages of three years and twelve years is obtained with sufficient accuracy by multiplying the age by 2.5.

The actual amount varies considerably from day to day, and seems to depend more on the amount of fluid taken than on any particular diet. Pyrexia from any cause diminishes the amount of urine considerably. The specific gravity in children beyond the age of infancy is often higher than in adults. It is not uncommon to find the specific gravity of the urine 1030–1035 or even higher. The percentage of urea is also higher in children than in adults; there is often 3 or 4 per cent. of urea.

Two other points are perhaps worth mentioning, namely, the frequence of uric acid crystals in the urine both of infants and of older children, and the common occurrence of a trace of albumin in the urine, especially in infancy and the earlier years of childhood. The albuminuria is generally very slight and transient, and seems in many cases to be merely a symptom of gastro-intestinal disturbance, and is not in itself of any serious significance.

The larger number of diseases of the genito-urinary organs the physician is not called upon to treat. The majority of malformations of bladder and external organs, stone in the bladder, balanitis, phimosis, hydrocele, &c., fall entirely into the hands of the surgeon. Of these I shall only say so much as concerns us; but others have a more entirely medical aspect. To begin with, it may be well to remark briefly upon some of the not infrequent morbid conditions of the urine in childhood. They are but symptoms, it is true; but their consideration as definite conditions saves both time and repetition.

Hæmaturia occurs under a variety of conditions, as the result of purpura, of scurvy, of scrofulous disease of the kidney or bladder (this not often), of calculus either renal or vesical; it is not uncommon as the result of small growths about the urethra of the female child, and may, of course, be present as the result of nephritis, of renal tumour, or of cystitis. But besides all these, and more puzzling than they, children are brought to the out-patient room with a history of frequent passage of blood in the urine. Perhaps they are admitted, and the blood, present once or twice within the first few hours, disappears altogether, and does not reappear. It is difficult to say whence the blood comes in these cases. In some it may be derived from the kidney, in association with the presence of uric or oxalic acid in excess in the urine; in some, perhaps, it is vesical, in association with the local congestion and irritation of ascarides; possibly some may be cases of hæmoglobinuria, of which I remember an example in the case of a little girl in hospital. All these things would disappear under the warmth, careful feeding, and mildly laxative regimen of a hospital. At any rate, I can say nothing more positive for the guidance of the student. The blood is sometimes passed in large quantity in these cases, the urine being port-wine-coloured and full of blood; and the peculiar feature is that it comes and goes quite suddenly, and there is no symptom of ill-heath of any kind. There may be a little frequency of micturition, and on several occasions the child has been sounded for calculus on this account, but without the detection of any cause for the hæmorrhage. The following case may serve to impress some of these points upon the reader:

A girl, aged seven, was admitted into the Evelina Hospital with the history that she had been passing blood in her urine occasionally for four months. She was sent to the hospital by Mr. Duke. She had had scarlatina twelve months before. Four months ago her mother first noticed that the urine was like dirty tea, thick, and —after standing—deposited a large quantity of red sediment. The child had never complained of any pain, and there had been no swelling of any part of the body, save that once or twice the mother thought the child's eyes were rather puffy. For six weeks past there had been blood in the urine. The colour of the blood was natural, well mixed with the urine, but some clots also. When she was admitted I remarked that some of the features were those of vesical growth, but that it was a frequent hospital experience that children with prolonged hæmaturia outside, speedily got well inside the hospital. So it proved to be. The urine on admission contained a quantity of blood, well mixed with the urine when passed, and a microscopic specimen consisted in great measure of blood-corpuscles, sp. gr. 1024, albumen $\frac{1}{8}$, no casts of any description. The child was admitted on the 8th of the month, and up to the 10th there was still much blood. On the 12th it was only indicated by the guaiacum test; on the 14th, more blood again; 15th, none; 16th, none; 18th, much, with a sediment of dark brown grumous stuff, a few granular casts, and much albumin, sp. gr. 1021, the character of the urine being quite that of renal disease. From this date only a trace of blood appeared once, but albumin appeared twice. She left the hospital three weeks later, apparently quite well. This child was never ill, never in pain, save that once she had an attack of abdominal pain while in the hospital, which might, perhaps, have pointed towards a renal calculus.

The indication is in all such cases to examine for all the diseases which are known to produce hæmaturia, particularly for nephritis, for crystals of oxalate of lime or of uric acid in the urine, for calculus in the bladder, for ascarides with prolapsus ani in either sex, and for some vesical growth in the female. Failing to find any disease to which to attribute the symptoms, the child must be kept in bed and watched, some gentle aperient being given, and probably some alkaline diuretic, the diet being kept for a day or two at milk food or fish. If the bleeding be severe it may be advisable to give a little gallic acid, some tincture of hamamelis, or possibly a little turpentine.

Hæmoglobinuria is rare in children, but sufficiently common to be worth remembering. In some cases we have seen it associated with evidence of congenital syphilis; but we have seen it also in scarlet fever, and sometimes with no obvious cause. The attacks as in adults are determined in some cases by exposure to cold. There may be no symptoms except the dark brownish-red urine; or there may be a feeling of lassitude, sometimes with shivering and pain in the back. The attack is generally quite short, lasting only a few hours: sometimes, however, it lasts a few days.

In the intervals there is occasionally albuminuria, and we have seen albuminuria apparently take the place of the hæmoglobinuria in one or more attacks.

No treatment seems to be of much avail except warmth, which is also to be relied upon for prophylaxis.

Anuria, or temporary suppression of urine, is a frequent affection in infants, and sometimes seems to depend upon an excess of uric acid in the urine. It is a condition which lasts but a few hours at most, is generally evidenced by symptoms of pain or discomfort when micturition takes place, and the urine, when examined, is found to be concentrated, highly acid, and to have deposited a copious sediment of urates or angular crystals of uric acid. The child should be kept warm in bed, allowed plenty of milk and water, and, if necessary, hot fomentations may be applied to the abdomen. Older children will frequently go many hours without the wish to pass any urine, and in these cases it would appear that but little urine is secreted, a condition no doubt dependent upon some paroxysmal irregularity of secretion, which is in accord with the natural physiological habit of childhood. It is necessary to bear this in mind, for, of course, catheterism should never even be considered, as it would be positively harmful.

Dysuria.—This is not an infrequent condition in older children. It would appear that the urine is a concentrated one; contains crystals of uric acid; irritates the passages in the passing; and so gives rise to frequent or painful micturition.

Causes.—Errors in diet and gastro-intestinal derangements appear to be the chief causes of these complaints, and they are frequent during dentition ; but it is not improbable that, as Dr. West remarks, they may be evidence of a constitutional tendency, and are liable to occur in children of rheumatic or gouty extraction. They are usually temporary ailments, but sometimes, in children of six or eight years of age, the passage of lithates or lithic acid may be associated with evidences of more prolonged ill-health. I have already alluded to this class of cases under Hepatic Diseases, to which of right they more properly belong.

Diagnosis.—Care must be taken to exclude scrofulous pyelitis, calculus, urethral growths, or rectal troubles.

Treatment.—Any errors in diet are to be corrected. Probably the quantity of food should be lessened, and fish rather than meat be given for a few days. As a medicine, it is generally sufficient to give some one of the laxatives already recommended —citrate of magnesia, compound decoction of aloes, &c., or sulphate of magnesia (F. 13). In such cases as seem to suffer from any prolonged ill-health, some dilute nitric or phosphoric acid, with the tincture of bark, may be given with advantage.

Polyuria, like hæmaturia, is in many cases difficult to substantiate. It is the complaint of many a mother as regards her child, but under hospital regimen it is the rarest thing possible. It may be occasionally due to saccharine diabetes.

Diabetes Insipidus.—Not long ago a girl, aged seven, was admitted to the hospital, who was said to have passed as much as half a gallon of urine in one night, and who had had polyuria, thirst, and wasting for three months. She continued to emaciate, and died without any adequate cause being discovered at the autopsy ; but, while in the hospital, her urine was never abnormal in any way. I have occasionally seen diabetes insipidus in boys of eight to ten years of age. They are very intractable cases, the thirst is so insatiable that they will drink anything, even soapsuds. Our experience does not allow us to say what is the end of these cases. After a time one loses sight of them. It is possible that the symptoms in some cases are due to the existence of chronic Bright's disease.

Diabetes Mellitus is also uncommon in early life. It has been seen, however, at as early an age as nineteen months.

When it does occur, I should say it is not uncommon to find it in children who look well, but who, notwithstanding, die before many months have passed, and, as with adults, suddenly, the child having been, apparently, no worse at the onset of the fatal crisis than it had been during the several weeks or months before. I have also seen a case where the sugar disappeared for a long period from the urine, the polyuria and emaciation, however, being as pronounced as ever. Diabetes in children may show much the same symptoms as in adult life. Languor and weakness may be associated with intense hunger and thirst. The peculiar sweet odour of the breath was noticed in one case. Wasting becomes a marked feature in some cases sooner or later. Sometimes quite suddenly, sometimes after a few hours of restlessness, the child becomes drowsy; there is obstinate constipation, and perhaps vomiting; respiration may become slow, and deep, and noisy, and with increasing coma death occurs. The occurrence of albumin in the urine was noticed in several cases for some days before death. The duration of the disease varies considerably. We have known a child to die within six weeks of the first onset of symptoms; perhaps the majority die within twelve months, but some children live as long as two or three years. Occasionally even the sugar disappears under diet and treatment.

Treatment does not differ from that of adult cases.

Pyuria.—Pus in the urine may come from cystitis from any cause, from scrofulous disease of the kidney, its pelvis, or ureter, from stone in the kidney (and, of course, in the bladder) and from any vaginal or pudendal discharge.

Spontaneous cystitis would appear to be not so very uncommon, and for the most part is associated with some febrile disturbance, together with frequency and pain in micturition, whilst the urine contains pus. Dr. Gee* records the case of a child of nine months, whose micturition was painless and not more frequent than usual. In some of these cases we suspect that the cystitis originates in some vaginal discharge, and spreads backwards.

A girl, aged four years, had suffered from vaginal discharge for four or five months. For a week before she was admitted she had

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* "On Some Kinds of Albuminous and Purulent Urine in Children," *Brit. Med. Journ.*, vol. ii. 1883, p. 961.

had frequent and straining micturition, and screamed when passing water. The urine was faintly alkaline, contained a small quantity of albumin, and a large deposit of flocculent pus. She was examined under chloroform, and plenty of pus issued from the urethra, but no cause for the cystitis could be discovered. She was treated with salicylate of soda (five-grain doses every four hours), and the micturition quickly became less frequent, and the pus gradually disappeared from her urine. The duration of the illness was six weeks.

Treatment.—For such cases as these the child must be restricted to milk foods, and salicylate of soda may be administered internally. Dr. Gee recommends benzoate of ammonia and pareira brava. Rapid recovery sometimes follows the use of urotropin, of which a child of six or seven years may take four grains three times a day.

Pyelitis as an acute disorder of infancy has recently attracted attention. It is a condition to be thought of in cases of obscure pyrexia in infants; and the occurrence of rigors is particularly characteristic, for apart from this disease rigors are an extreme rarity in infancy. There is usually much restlessness and distress, and sometimes apparently colicky pains. The temperature is often 104° or higher, and is of remittent type, so that the chart may be not unlike that of typhoid at this age. The diagnosis is made by examination of the urine which is found to contain pus, sometimes in sufficient quantity to make the urine turbid, and at the same time the urine is acid, not alkaline as is usual in cystitis.

Of eight cases recorded by Dr. J. Thomson,* all were girls, and both in infancy and in the cases which occasionally occur in children beyond the age of infancy, the female sex seems to be much more often affected than the male. This is probably to be explained by the route of infection, which appears to be per urethram; a bacillus which resembles the colon bacillus has been detected in the urine in several cases. The prognosis is good, under treatment recovery occurs within a few weeks usually.

Treatment. — Thomson recommends large doses of potassium citrate: twenty-four to forty-eight grains being given in the twenty-four hours; this dose has some depressing effect on the infant, perhaps causing vomiting, but is to be continued notwithstanding until the pus disappears. Urotropin has also been used, but without great success in this condition.

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* *Scottish Med. and Surg. Journ.*, July 1902.

Pyuria as a chronic condition is more likely to be due to some scrofulous condition of the kidney (when perhaps it may be possible to distinguish some enlargement of the organ by palpation of the loin) or to stone.

Scrofulous Kidney may be associated with pain in the loin, with frequency of micturition, and with a flocculent sediment of pus in an acid urine, occasionally with a streak or two of blood; but it is quite necessary to remember that it may be present also without any characteristic symptoms. The usual course of these cases is, after commencing in the renal pyramids, to produce gradual erosion and excavation of the organ, and extension of the disease along the ureter to the bladder; but in the male there are often separate centres of caseous disease in epididymis and prostate, and these parts should be examined in the hope of throwing some light upon the diagnosis. The disease is unilateral in the sense that one kidney is generally much more advanced than the other, but it is seldom confined entirely to one organ in old-standing cases. The kidney in the late stage is much enlarged. Bacilli (bacillus tuberculosis) are present in the urine. Patients with scrofulous kidney are subject to the risk of an outbreak of general tuberculosis, and this is the usual cause of death.

Treatment.—In the early stage every effort should be made to improve the child's health. There is plenty of clinical evidence to show that scrofulous disease of the urinary passages is often of very slow progress; there is also plenty of evidence from the post-mortem room, in the existence of calcification and tough fibrous tissue, that here, as elsewhere, the disease undergoes processes of repair, and may become encapsuled. Therefore in the early stage resort should be had to sea, or, at any rate, pure air, and such foods as cream and cod-liver oil.

As drugs, chloride of calcium should be given internally, or, perhaps, iodoform, if it can be taken. In the advanced stage, where there is a permanent and profuse discharge of pus which nothing can control, much pain and distress from frequent micturition, and progressive anæmia, an exploratory operation may be performed, and the kidney drained, and possibly, should it be necessary, subsequently removed.

Renal Calculus is sometimes, though by no means necessarily, associated with definite colic and hæmaturia. Renal colic in children is represented by, or perhaps it should be said described by them as, an abdominal pain referred generally to the umbilicus or front of the abdomen, and as such may easily be overlooked—nay, more, it is possible that in very young infants some of the abdominal pains which are supposed to be due to flatulent colic own a similar cause, for, as has been shown by Dr. Gibbons,* the symptoms have been associated with the passage of uric acid crystals. A simple chronic or intermitting pyuria, with some irritability of the bladder, may be all that points to the existence of stone. Calculus in the kidney is not uncommon. It will not be always possible to make a diagnosis; but by keeping the possibility of its presence in the mind after these few suggestions, a mistake may sometimes be avoided. In all these cases the urine should be examined microscopically. A prevalence of crystals may point to the presence of a stone and indicate its probable composition; and the presence of blood-corpuscles, if only a few, may add to the certainty of a diagnosis. The Röntgen rays may also be of value in the diagnosis of this condition, especially if a positive result is obtained.

Acute Nephritis has already been dealt with in some measure as regards symptoms and treatment under the head of Scarlatinal Dropsy (pp. 197, 213). But the subject must be introduced here again, for there are a large number of cases of acute nephritis in childhood which are not related in any way to scarlet fever. And on this point we would lay some stress, for there is a tendency to assume a scarlatinal origin for nephritis, sometimes even when there is little or nothing in the previous history to suggest such an origin.

Almost all the specific fevers are occasionally followed by, or complicated by nephritis in childhood; we have seen acute nephritis with whooping-cough, mumps and influenza, and Henoch mentions its occurrence in measles and in varicella; the latter occurrence we have also observed. Moncorvo has described several cases of acute nephritis in children with malaria. Diphtheria, although a common cause of albuminuria, is in our experience but seldom a cause of nephritis in children.

Whether rheumatism ever causes nephritis is perhaps uncertain, but we have twice seen nephritis occur in children who had suffered with acute rheumatism, and have wondered whether this might be more than a coincidence.

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* *Med. Chir. Trans.*, vol. lxxix.

Congenital syphilis is undoubtedly a cause of acute nephritis in infants; we have recorded one case* of this nature in an infant at the age of six weeks, and several other cases have been observed: in older children it is probably a cause of chronic interstitial changes in the kidney.

But although all these causes are to be considered, it will be found that of the non-scarlatinal cases of acute nephritis in children, the large majority are not traceable to any particular cause, unless indeed exposure to cold and wet may be the origin of the disease.

Acute nephritis is not very rare in infancy, but is more frequent in children beyond this age.

Symptoms.—In infancy the disease may show itself by general œdema as in later childhood; but Dr. Emmett Holt has pointed out that in infants particularly all the diagnostic symptoms may be absent unless the urine be examined, and at this age the nephritis is often associated with pyrexia. As an example of more obvious manifestations the following case may be quoted:

A male infant, aged nine months, a hand-fed but remarkably healthy-looking child, became fretful after a journey into the country, and after an expiration of a fortnight was suddenly noticed to be dropsical. The weather was changeable at the time, and, there being no definite symptoms before the swelling took place, the child had been allowed to go out daily. The urine may have been somewhat scanty, but was not otherwise obviously abnormal to the mother's eye. With the onset of dropsy, Mr. Frederick Wallace was consulted, and he found the urine to be albuminous. A few days later, when we saw the case together, the child was pale and generally anasarcous, the swelling being of a firm character, and pitting nowhere easy to obtain. The eyes were half closed, so much was the œdema. The urine was of pale colour, and the precipitation of albumin rendered it nearly solid, but no casts could be detected in the sediment. The child was treated with small doses of citrate of potash; its milk, of which it was a rather gross feeder, given in a more dilute form, and it had a hot bath twice a day, with flannel wrapping after to favour free sweats. Mr. Wallace tells me that the albumin had quite disappeared in about four weeks, and the child was well in about six weeks' time. As the albumin began to diminish small doses of citrate of iron and ammonia were given.

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* *Practitioner*, July 1904.

In older children the common history is this: the child becomes dropsical and pale, and, when summoned for this, the doctor finds the urine scanty, smoky, containing a large quantity of albumin and blood. Under the microscope, blood, renal epithelium, and hyaline casts are found. Perhaps on inquiry a moderate degree of pre-existing malaise may be acknowledged to have existed some few days or weeks before, and the disease is sometimes ushered in with greater severity, such as by convulsions or obstinate vomiting.

Dr. Gee has pointed out that in these older children sometimes as in infants, acute nephritis may be wholly latent, and that the nature of the disease will certainly escape notice if the urine be not always examined as a matter of routine. There may be fever, vomiting, and even coma, and *per contra*, there need not be any fever or any dropsy.

The following case is a striking illustration of these remarks:

A child of seven was brought to the Evelina Hospital by her father, who stated that she had been perfectly well till four days before admission, when she began to vomit, and this she had continued to do. On admission she was in a restless condition, with quick pulse. She frequently vomited, and her urine contained a quantity of albumin and a few granular casts. She was carefully examined, and nothing more could be elicited, except that the area of præcordial dulness was decidedly increased. Her temperature was subnormal, and there was no dropsy. She had a slight convulsion, and died within twenty-four hours of her admission. The post mortem examination revealed an acute congestive nephritis, with dilatation of both right and left ventricles of the heart.

If the case does well the albumin will perhaps begin to vary, and, on the whole, lessen in quantity, the dropsy decreases, the urine becomes more copious, its specific gravity improves, perhaps lithates appear, and ultimately the child improves in flesh and in colour. If, on the other hand, the result is adverse, the albumin remains in quantity, and the urine is scanty; after a time the diuresis may become more free, and much of the dropsy may go, but the child remains pale and emaciated, the albuminuria does not lessen, and the course is slowly downward. Of the more common symptoms these points may be noted :

Convulsions are usually preceded by a markedly scanty urine or even temporary suppression. They often cease in the course of a few hours under appropriate treatment, and the establishment of a more free secretion of urine.

Vomiting is a symptom of somewhat equivocal meaning, as it may occur in children in good condition and who ultimately do well ; or be associated with suppression of urine, much restlessness, and œdema of the lungs.

The **urine** almost always contains a large quantity of albumin at the onset, but this may vary, and sometimes much so, from day to day. In other respects, also, the urine may vary. It is usually scanty at the onset and may remain persistently so, or quickly become more copious ; it may be fully charged with blood, or meat-juice-like, or smoky. Polyuria and thirst are generally indicative of disease of old standing.

The **dropsy** is usually persistent, but not always. It may disappear quite rapidly, corresponding in this with the re-establishment of diuresis and a diminution in the amount of albumin passed. It is important to remember this association of symptoms, for there is a subsidence of the dropsy unassociated with any material diminution of the passage of albumin, which inspires not hope, but fear for the existence of a malady that has passed the limits of complete recovery. Dropsy is not by any means always present. Nephritis sometimes runs its course from first to last without any, and this may be as well in those that do badly as those that do well. Relapses of dropsy are not uncommon.

One child may seem to suffer from sharp fever only ; another be drowsy or convulsed ; another may be purged and collapsed ; another simply strikingly anæmic. Therefore an examination of the urine is always to be made, and over and above this, scantiness of the urine is the most constant symptom in childhood pointing to defective renal activity.

Complications.—Of these the chief are convulsions, anasarca when extreme, dropsies of the serous cavities, œdema of the lung, broncho-pneumonia, dilatation of the heart, and diarrhœa.

Duration and Course.—Upon this head it is difficult to speak to much purpose, the variability of individual cases is so great. Given an average case, the albumin may continue to diminish and disappear in from three to five weeks, or it may linger on, now more, now less, for many weeks, and sometimes for many months. Provided that there is on the whole a decided improvement, there is no need to be disheartened by a lingering attack.

Diagnosis.—Bear in mind that most of the usual diagnostic symptoms may be absent, and that the younger the child the more likely is this to be the case. Not only so, but other symptoms may exist which seem to point in quite other directions.

Chronic Nephritis.—Occasionally we have seen in children a chronic disease quite like the chronic interstitial nephritis of adults. There is the hard pulse, the hypertrophied heart, the absence of dropsy, the pale urine with low specific gravity, small amount of albumin and few granular casts. In such cases also we have seen advanced albuminuric retinitis.

The onset of this chronic disease has been usually quite insidious, with no history of scarlet fever or other obvious cause. It is suggested, we think, with much probability, that some of these cases are the result of congenital syphilis. In the late stage the only symptom, excepting the condition of the urine, may be severe headaches, and where there are attacks of convulsion and vomiting it is easy to mistake the case for one of cerebral tumour. These cases, too, are often much wasted, thirst is a marked feature, and the amount of urine is so excessive in some cases as to suggest a true diabetes insipidus. The prognosis is bad; most of these cases die of uræmia. A contracted granular kidney has been found post-mortem, at the Hospital for Sick Children, Great Ormond Street, at the age of two and a half years.

Treatment.—The general principles are common to all ages —viz., to relieve the kidney of as much of its work as may be possible; first, by confining the diet to fluid and weakly nitrogenous constituents; and secondly, by making other organs, notably the skin and bowels, take up the chief stress of work. Another principle of chief importance with many is that of flushing the renal pipes with watery fluid.

Far be it from me to say anything in disparagement of these fundamental rules, but I will say as a guide and guard that the student will not have gone far along the road of experience before he will have found out how coarse is still our physiology in these respects, and how difficult his aims may be of accomplishment, and even how harmful sometimes are the results which alone he seems able to procure. By this I mean to enforce that there are many orthodox and proper and valuable means of alleviating and curing diseases which are handed on from teacher to pupil, from generation to generation, and which are applied as a matter of course each for its proper disease, as a mere matter of routine. But all routine is bad. Every case of disease requires separate thought, and so far as our knowledge and judgment will enable us to see it, its own proper modifications of routine; and to renal disease such remarks are especially applicable, because the treatment is largely concerned with such common things as baths and packs and purges and diet. But even in these things we must *think* before we *act*, and it does not follow that because the usual remedies are simple, that they are therefore harmless, and therefore applicable to all cases alike. With this proviso, then, the patient suffering from acute nephritis is kept in bed, between blankets. The skin is made to act freely by the administration of liquid foods and water, and diaphoresis is aided by such medicines as acetate of ammonium and the compound ipecacuanha powder.

Additional and powerful means of promoting the action of the skin are pilocarpin and the wet pack. The former is a remedy that requires to be used with great caution; it is liable to produce alarming collapse. I have usually administered it in doses of $\frac{1}{15}$ to $\frac{1}{12}$ grain hypodermically, or in doses of $\frac{1}{8}$ to $\frac{1}{4}$ grain by the mouth, but I much prefer the wet pack. An old and thin blanket is wrung out of hot water, and the naked child is enwrapped from throat to feet; a dry blanket is packed round it and loosely covered with a mackintosh. It may be continued for twenty minutes, thirty minutes, to an hour, then removed, and the child swathed in a dry blanket. The temperature of the child is to be watched during the pack, for every now and then it provokes a sudden rise, even to hyperpyrexia, when of course it must be instantly discontinued For other cases warm baths and vapour baths may be used, but even these need watchfulness, for Barthez and Sanné recount the occurrence of sudden œdema of the lungs and death after their employment in several instances; and these authors consider that they are most suitable in chronic conditions, and with healthy lungs.

Of drugs: the citrate of potash to make the urine alkaline, benzoate of sodium, which, in conjunction with a little caffeine, makes an excellent diuretic, and digitalis (F. 39) and strophanthus and some mild aperient are the most in request; and after the acute stage has passed off, a little acetate or perchloride of iron is generally useful. The diet is for the most part reduced to milk food, varied as much as possible by the introduction of vegetables, ripe fruit, cream, &c., and with the free administration of soft water.

Most of the complications of nephritis, a measure as they mostly are of the incompetency of the kidneys, are relieved by methods which may be applied to them in common. The convulsions are best treated by dry cupping—many think wet cupping—poultices to the loins, or the wet pack. The bowels must be freely relieved by calomel, and enemata of bromide of ammonium (twenty or thirty grains) may be given as required. For the most part these measures prove sufficient, and the child slowly comes round from the drowsy state succeeding to the fit, and the urine is secreted more copiously. In the severer cases, ice may be applied to the head, chloroform administered, and hydrate of chloral added to the bromide. Dr. Barr speaks well of benzoate of ammonium for preventing the recurrence of a fit.

Obstinate vomiting may require special measures in the way of bismuth, hydrocyanic acid, and special dietary. Hæmaturia may *sometimes* require the administration of hamamelis, ergotine, or tannic acid.

For the dilatation of the heart, digitalis, strophanthus and caffeine are the most useful remedies, and to this list spartein sulphate is added by some, as being useful now and then in ¼-grain doses.

Functional Albuminuria (Cyclic albuminuria: physiological albuminuria).—It is not uncommon to meet with an albuminuria in children which there is no reason to suppose to be connected with renal disease. The essential feature of these cases is that albumen is present in the urine at some period of the twenty-four hours and not at others.

Some of these cases have been specially described as "cyclic" albuminuria, because the disappearance and reappearance of the albumen have presented a definite relation to the daily routine of life; some, for example, have shown albuminuria whenever the erect posture has been assumed, others in association, perhaps, with certain meals, and others have varied without any definitely ascertainable cause.

The **symptoms** which accompany this functional albuminuria are vague indeed, although we have known them to be sufficiently obtrusive to suggest the diagnosis before examination of the urine. The child is usually brought because it is ailing although not actually ill; it is pale, and sometimes a little puffy under the eyes, the skin is moist; the child has frequent headaches, is nervous and excitable, complains, perhaps, of vague pains in the back or loins, and perhaps suffers with frequent nausea and pains in the abdomen. Dr. Sutherland notes the occurrence of epistaxis in several cases of cyclic albuminuria. Most writers have characterised the pulse-tension in this condition as low, but Dr. Dukes, of Rugby, makes much of a group in which, with a healthy appearance, the pulse-tension is high.

Prognosis.—After watching many of these cases over a long period we know of no evidence that renal disease results; on the contrary, although many cases pass out of view without our being able to say what becomes of them, we have some evidence that the condition may pass off without any ultimate deterioration of health, and it is our belief that this happens in the majority of cases.

Treatment.—Is not very satisfactory: the general health must be supervised, and symptoms dealt with as they arise. The diet and the quantity of food should be regulated, and every attempt must be made to ensure proper mastication. These cases are not to be treated as if nephritis were threatening; they require plenty of fresh air and everything tending to make them robust.

Paroxysmal Albuminuria.—A few cases that deserve this name have come under our notice. A child showing much the same symptoms of weakly health as those above described has periodical attacks of fever associated with albuminuria, which passes off after a few days, leaving the urine perfectly healthy, and this history repeats itself from time to time.

The albuminuria in these cases is unaccompanied by casts or œdema, or indeed by any symptoms of renal disease; and between the attacks the child is in its usual health.

Taking these cases in connection with the statement which we make elsewhere (p. 472) with regard to hæmoglobinuria, it seems not unlikely that the two groups of cases are intimately related. At first sight they might suggest the occurrence of some inflammatory condition of the kidney, but in the rapid return of the urine to the normal condition, and in the absence, above noted, of any symptoms of renal disease we have evidence that this is not so.

Renal Tumours.—A tumour in the loin may be due to hydronephrosis, a rare condition in a child; to perinephric cysts, due to rupture of the ureter or kidney from fall or other injury; to a sacculated abscess in a scrofulous kidney; to an abscess around the kidney, either connected with spinal disease or of renal or peri-renal origin; or to a sarcomatous growth of the kidney.

Of **hydronephrosis**, the following case is a good illustration, as it is also of a perhaps unusually rapid formation of the tumour:

A boy, aged six, was under the care of the late Mr. John and Mr. Herbert Burton, of Blackheath. Three weeks before I saw him he had had a severe attack of sickness, and his abdomen, which had always been of sufficient size to procure for him the nickname of "Falstaff," was noticed to be larger than usual. At this time he complained of sharp abdominal pains, but the vomiting did not recur. When first seen the whole of the left side of the abdomen extending beyond the median line was occupied by a hard and apparently solid tumour. There was some fluid in the peritoneum. He had sharp pains in the abdomen. The urine was healthy. I saw him a fortnight later. He was a bright, healthy child, rather thin, of gouty parentage. The left side of the abdomen was occupied by a large lobulated elastic swelling, which extended from the loin over to the right of the umbilicus. There was a distinct thrill from back to front. The urine was limpid, and contained neither albumin, blood, nor sand.

The history and physical signs all pointed to calculus and subsequent hydronephrosis. Opium had already been given regularly, and it was decided to continue this with belladonna for a few days longer, with the result that three days later there was a sudden increase in the quantity of urine passed (3 pints); the following day 3½ pints were passed; the tumour entirely disappeared, and no further symptoms were noticed.

The **cystic collections** of fluid which sometimes follow injuries to the kidney are interesting and, in some respects, peculiar. Mr. Godlee* has published three cases of this sort, and, in addition to two others that I remember to have seen some years ago at Guy's Hospital, two others have come under my notice, one at the same institution and one in the practice of Mr. Watson of Rochester.† A boy of eight, of healthy parentage, fell on his right side. Eight days afterwards he began to pass blood in his urine, and continued to do so for more than a fortnight. This gradually ceased, but the abdomen continued to enlarge, and his size was so much increased that his waistcoat could not be buttoned. A large cyst of fluid occupied the right side of the abdomen; after a time it gradually diminished, but when I saw him, three and a half months after the injury, there still remained what appeared to be a large flaccid cyst with fluid contents occupying the right loin and right hypogastric region, which subsequently entirely disappeared.

These cases are, I say, peculiar, and they are so because, whereas it is probable that they are due to circumscribed extravasation of urine, they nevertheless form slowly, without any great degree of injury to the general health, and without the production of any such destructive tissue changes as are well known to occur in extravasation of urine in its more common seat.

The scrofulous kidney has already been described, and there remain only **perinephric abscess** and new growths. As regards the former, its presence is presumptive evidence in favour of spinal disease, and a careful examination of the vertebral column should be made to establish the existence or not of any local disease; but it is not always found. Extensive collections of pus may form around the kidney, which, if opened and drained, are speedily cured. In such cases the tumour is deep-seated and immovable, often ill-defined, from the presence of the

* *Trans. Clin. Soc. of Lond.*, 1887.

† *Ibid.* vol. xxiv. p. 61.

colon in front of it. There is generally a good deal of pain, and some rigidity or flexion of the hip from implication of the origin of the psoas muscle, or pressure upon nerves. I once had a case of this kind in a child of about seven. Mr. Lucas explored, and then opened and drained, a large abscess, and the child was well within a week or two. In such cases, generally of doubtful nature at first, we must watch carefully for the formation of fluid, and—should evidence be found of its existence—explore with a fine aspirator, and act according to the result. If pus is present, an opening should be made in the lumbar region, and the abscess be drained. Perinephric extravasation of urine, due to rupture of the kidney or ureter, will require, in all probability, surgical treatment of some kind with a view to the removal of the fluid and the prevention of its reaccumulation, but it is to be noted that much uncertainty attaches to the exact seat of the accumulation, and that in some, at any rate, of these cases the tumour has caused but little constitutional disturbance, and has subsided by natural processes or simple aspiration.

New Growths.—These are chiefly sarcomata. They are not very uncommon. I have seen several cases. Like all tumours in early life, they grow rapidly, and ultimately produce an enormous distension of the abdomen. They are at the onset, and remain for some time, unilateral. In Leibert's series of fifty cases the affection was bilateral twice only; therefore in this respect they are favourable cases for operation. But when they have been long in existence, and have attained a large size, secondary nodules may be found in the other kidney or in the lungs, &c. They grow for some time without attracting much attention, for they are not associated with much wasting; they are unattended by pain, and they are not, so far as I have seen, generally accompanied by hæmaturia. Thus it happens that not till the abdomen—and therefore the tumour—attains a large size, is the child brought for treatment.

They occur in quite young children of eighteen months to three or four years old (of fifty cases collected by Leibert twenty-six were under the age of three years),* when the removal of a mass so large is necessarily a most formidable operation. But if they should be recognised sufficiently early, considering that they are usually local tumours and certain to prove fatal if left alone, an attempt at removal is, I think, justifiable; Angel Money thinks not. Of six cases in the Evelina four came under my own notice, and two under the care of a colleague. In one the removal of a very large tumour was attempted by Mr. Howse in a boy of two years, and had to be abandoned—a result for which we were prepared; in another case, under Mr. Howse, the tumour was removed, but the child died very soon after the operation, also a result for which one must be prepared if the operation is to be undertaken at all; in a third case, after the most careful consideration of all the circumstances, we decided to operate, and Mr. Symonds removed the tumour, but, although not in this case very large, it had already infiltrated the outer coat of the colon, and therefore, had the child recovered, little advantage would have been gained; and in a fourth case, under Mr. Howse, the tumour was removed, and the wound healed, but the child afterwards died of measles. Another not operated upon died after many weary months of gradual emaciation, and in the other cases I have seen I have advised against operation, or have lost sight of them—the parents, with whom alone a decision so momentous must rest, being unable to decide whether they would risk an operation.

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* *Jahrbuch für Kind.* Bd. xxi. p. 276.

Nocturnal Incontinence of Urine, or Enuresis.—There are few conditions which require more careful investigation than this, and few in which such a variety of circumstances may conspire to bring it about. Granting that it is due to a nervous fault, the results of treatment would seem to show that sometimes it is due to hyper-sensitiveness of the centre, sometimes to deficiency of the natural delicacy of perception either on the part of the lumbar cord or the higher centres to which it should transmit its own knowledge.

Many another consideration also does the disease entail! In some cases the constitutional build of the patient must be considered; the sleeping habits of the nervous system; the question of developing sexual sensation; the condition of prepuce, urethra, rectum; the possibility of the existence of local disease; the presence of ascarides; the condition of the urine; the diet; and in confirmed cases, the question of habit. The mere mention of all these things will be sufficient to show that, whoever will treat enuresis with success, must be prepared for a preliminary inquiry of a somewhat complicated nature.

After saying thus much, it will not be expected that I should advise the reader to hit out at random with belladonna, or bromide of potassium, or chloral. Each case must be investigated carefully, and treated accordingly. If there be any phimosis, this must be attended to, not necessarily by an immediate circumcision, but at any rate by retraction, separation of any existing adhesions, and the removal of any retained secretion that may be present. Circumcision is a useful thing if there be reason to suppose that the length of the prepuce or the tightness of the phimosis is a disposing cause. Local congestion, perhaps due to constipation, or to the presence of worms, must be examined for. In other cases the tone of the nervous system is at fault, and during the night there is a general or local erethism of the nervous centres which leads to this spasmodic discharge. This state of the nervous centres is sometimes constitutional and closely associated with rheumatism. In this case it goes with, or is allied to, such nervous disorders as nightmare, somnambulism, possibly even epilepsy. In other cases this nervous erethism is dependent upon sensations which have their origin in the developing sexual centre, and I suspect that there is a form of nocturnal incontinence which represents the seminal emissions of the mature organism. Allow all this, and how complex the question becomes! Sometimes there is the low tone and inbred sensation; sometimes the discharge may be called into action by external circumstances, such as a too warm or a too comfortable bed; sometimes, may be, there is some local peripheral excitement, a long prepuce, or an over-acid or an alkaline urine, for example. In some children, again, it seems that sleep is too sound, and secretion too rapid; and the reflex centre, uncontrolled, acts in accordance with its natural habit, and the urine is passed into the bed.

Thus, in enuresis very much the same questions come over again that have already been discussed in connection with the gastro-intestinal derangements of infants. A little physiological reflection, if it does not make the whole subject clear, at any rate leaves one with the comfortable opinion that something is known about it, and with definite aims in the treatment of a somewhat mixed class of cases.

Of thirty-eight cases, twenty were girls and eighteen boys. The favourite age is about seven; but twenty-seven of the thirty-eight occurred from six to eleven years; seven others at three and four years of age. Eight occurred in rheumatic families.

The **treatment** of these cases justifies all that I have said. There are some which are cured off-hand by bromide of potassium and hydrate of chloral, just as infantile convulsions and night terrors are almost certainly controlled; there are others as certainly improved by belladonna, or its alkaloid the liquor atropinæ, which not only heightens arterial tension and thus tends to restore the nervous tone, but also has some paralysing effect on the afferent nerves, while it is well known to control what is, as I have maintained, the allied condition of seminal emissions. For this latter remedial action Unna speaks highly of the liquid extract of rhus aromatica; five drops three times a day for children under two years, ten drops to those between two and ten years, and fifteen to such as are older. Ergot succeeds in some cases where other remedies have failed. Ten to twenty minims of the liquid extract may be given two or three times a day to a child six years old, but it should not be continued more than ten days or a fortnight.

In some cases the tincture of lycopodium has proved useful in doses of half a drachm for a child six years old. Dr. Coutts, who has specially advocated the use of this drug, considers that it is best administered as the tincture, commencing with a dose of twenty drops three times a day, gradually increasing it till a drachm twice a day is reached. There are other cases best treated by good nervine tonics, such as strychnine and dilute phosphoric acid. Others, such as the heavy sleeper, must be less luxuriously housed. Others, again, of rheumatic tendency, may be passing a highly acid urine, which irritates the bladder and provokes expulsion; this may, perhaps, be remedied by cutting off all meat from the diet for a week or ten days, and adding some bicarbonate of potash to the food. If the urine is turbid and alkaline, a condition which is quite as provoking to the bladder as an over-acid state, though not so frequently met with, dilute phosphoric acid and nux vomica or a little salicylate of soda should be given, and the starchy elements of the food diminished. In all cases a better habit should be favoured by restricting the quantity of drink towards the end of the day, and by arranging that the child is taken up to pass water late at night, early in the morning, and, if necessary, during the night. The general health must be looked to, and tepid and cold bathing be practised when possible.

Occasionally the incontinence is not only nocturnal, but occurs during the day also. It is then likely to be very intractable, and necessitates a very careful examination of the pelvic organs under chloroform. It may be that, by long persistence of the habit, the bladder has become so contracted as to be incapable of holding any quantity of urine, and in such cases I have once or twice found benefit from distending the bladder by water, under chloroform.

Long persistence in the habit will necessarily make the case obstinate ; as a poor sort of comfort we may remember the usual doctrine, that such cases usually ameliorate at puberty ; and to this I would add that, in proportion as an intelligent appreciation of the problem is brought early to bear upon any individual case, so is it likely to prove tractable. Intractability is the recompense of an indolent and undiscriminating administration of belladonna, or whatever comes first to hand.

I may even venture, without waste of time, to expatiate further on this topic, for if I were to single out two diseases from which the student is not unlikely to add least to his reputation, I should certainly couple incontinence of urine in childhood and chorea. And this not at all because they are obstinate—though I am far from denying that—but because the difficulties as regards treatment are seldom fairly grappled or placed before the parents. As one who, from the very nature of his practice, sees something of a side-light of the relations existing in such cases between the medical man and his patient, this is my experience : A child suffers from incontinence of urine ; for some time no medical advice is sought ; when it is, belladonna is usually prescribed. The child is seen in a casual sort of way every few days ; there is a lingering medical attendance ; and in the end very little, if any, improvement. Then comes a relapse from all treatment, and after a time " further advice " is sought, in most cases without any intimation to the original attendant, and with a very strong disinclination on the part of the parents to return whence they came, because of their fruitless experience. Now, see what has happened: an appetite for a "prescription" has been whetted, the parents have been led to believe that some drug is the panacea, if only some one can be found with sufficient acumen or experience to recommend the right one. They have no insight or knowledge of disease as a habit which is only to be controlled by close medical supervision; or if by drugs, by such as are potent, given with a free and therefore necessarily with a very watchful hand. Over and over again parents are found to grumble at the prospect of a lengthy medical attendance, a poor receipt, as they consider it, beside the three-ounce bottle of medicine and a cure in its dregs, for which they thought to come. Now, the parents are in many cases not so much at fault as the doctor. This disease is too often treated with a *nonchalance* which conveys the idea that it is an inconvenience which must be put up with if it is not cured off-hand by so much belladonna. But is this so in fact? Is it not much rather a malady productive of the greatest misery to the child, a great hindrance to his education; a malady, in short, in which anything less than the exhaustion of every possible means of relief is a cruelty? The worst cases are confessedly troublesome, and if they are to be combated successfully, the reason of their obstinacy must be explained to the parents at the onset. By so doing their intelligence will be enlisted in furthering the efforts of the doctor; they will understand the reason and the necessity of a possibly arduous attendance; they will be prepared for, not disappointed or not disheartened at, a failure; and the utmost will be done to effect a speedy cure.

Incontinence of urine is sometimes associated with incontinence of fæces, in which case the fæcal incontinence is diurnal, the urinary may occur at any part of the twenty-four hours. This group of cases is probably distinct from that of simple nocturnal incontinence, for it is nearly always associated with peculiarities of mental action, which indicate that the treatment should be moral rather than physical. For instance, although these children are apparently quite sane, one may be subject to outbursts of passion, another will be unduly timid, another will be quite insensible to pain, another may be sullen; in all, in fact, if inquiry be carefully made as to home behaviour, there is some unnatural mental trait which shows that we are dealing with some of the milder forms of mental instability.

Our experience has not led us to think highly of local treatment in these cases; they do well under kind but firm moral control: it is best to send them away from home to a small school, and in most cases the condition disappears.

Calculus Vesicæ only needs mention as a complaint of which the *diagnosis* frequently falls upon the physician. Five cases came under my observation during the years that I saw out-patients at the Evelina Hospital. The symptoms are pain and frequent micturition, stoppage in the flow of urine, uneasy sensations after emptying the bladder—worse when moving about—the occasional presence of a little blood in the urine, of pus or mucus in excess more frequently, and incontinence of urine.

Diagnosis.—Many things simulate stone—*e.g.*, rectal worry by worms or polypus; penile worry by a long or adherent prepuce; and disease of the kidney or bladder, especially tubercle; and in the female, vaginal discharge. The diagnosis of stone in the bladder may now be made more positive by the use of the Röntgen rays; its further confirmation by sounding falls within the province of the surgeon.

Vaginal and Labial Discharges are due to some eczema of the external parts, or to some catarrhal state due to the presence of worms, or to ill-health in scrofulous or tubercular children. There can be no doubt whatever that in some cases the discharge is infectious: it has sometimes spread from child to child in families, and epidemics of vulvovaginitis have occurred amongst children in schools and other institutions.

In a considerable proportion of the cases of vulval discharge in children a diplococcus resembling the gonococcus is found; in some cases it is probably identical with the gonococcus, but it must not be hastily concluded that all diplococci found in these discharges are gonococci, there are probably other micro-organisms which, although morphologically resembling the gonococcus, present differences on careful investigation. Even if micro-organisms indistinguishable from the gonococcus are found in the discharge, it must not be concluded that, therefore, vulvovaginitis is the result of foul play of any kind; there is not the least doubt that such micro-organisms are commonly found in the pus of vulval discharges in children, where there is no ground whatever for supposing any such cause for infection; and, indeed, in the majority of cases the micro-organisms would seem to gain access from some entirely accidental source.

In other cases various micro-organisms have been found, particularly staphylococci.

Symptoms.—In the majority of cases there are no symptoms beyond the presence of more or less profuse purulent discharge from the vulva. Occasionally some pain on micturition is complained of, and the labia majora may be somewhat red and swollen: pus may be seen to exude from the urethra: and in severe cases there may be slight erosion of the mucous membrane about the orifice of the urethra or vagina. It is very rare in our experience to find any swelling of the inguinal glands. The symptoms are apt to be most acute in the cases in which the gonococcus is present in the discharge.

Complications.—It is in the gonorrhœal cases also that complications are most apt to arise, but happily all of them are rare. We have seen arthritis, exactly like the gonorrhœal arthritis of adults, with vaginal discharge in quite young children, and it can hardly be doubted that in these cases, as in those recorded by Mr. Lucas, in which arthritis occurred with gonorrhœal ophthalmia in newborn infants, the joint disease is a result of gonococcal infection. Several cases have been recorded recently of peritonitis complicating vaginal discharge in children, and it has been shown that the inflammation extends upwards along the Fallopian tubes (*see* p. 438). Ophthalmia is also an occasional complication.

Treatment.—All cases of vulval discharge in children should be treated as infectious: it would seem that, whether the gonococcus is present in the discharge or not, the disease may spread from one child to another, and also to adults: and those who have charge of the child should be warned of the risk of infection to themselves, and the necessity, therefore, for washing their hands after tending the child. The child should sleep in a bed by herself, and should have separate sponges or flannels for washing, and separate towels: and if the temperature is being taken in the rectum a separate thermometer should be kept for the child.

The vulva and vagina should be thoroughly douched three or four times a day with warm boracic lotion, or a weak solution of zinc sulphate (gr. i–ii to the ℥j), or lead lotion may be used. If these measures are insufficient, a solution of perchloride of mercury, 1 in 5000, or protargol, a 2 per cent. solution, may be more effectual. We have often found that by keeping the child sitting in a large basin of warm boracic lotion, or of the zinc sulphate lotion mentioned above, for ten or fifteen minutes twice a day, better results were obtained than by douching alone, which, in the hands of an inexperienced mother or nurse, is apt to be done in very inefficient manner. It is important also to see that the underlinen is changed sufficiently frequently : it is little use attempting to disinfect the vulva if it is constantly being reinfected from soiled underclothing.

Many of the girls with vulval discharge are in poor general health, and there can be little doubt that the administration of cod-liver oil or malt, or one of the preparations of phosphate of iron, assists in the cure. If worms are present, they must be attacked by enemata or by the administration of santonin.

Noma Pudendi we have but rarely seen. Dr. Marshall notes it as not uncommon after measles. It has also been recorded after typhoid in children. Henoch mentions its association with gangrenous processes in other parts of the body, instancing the case of a phthisical girl, aged twelve years, in whom gangrenous destruction of the labia was associated with gangrene of the lung.

The symptoms exactly resemble those of cancrum oris except for the difference of position : a hard brawny swelling of the labium majus is associated with purplish discoloration and soon by a sloughing ulcer, which may completely destroy the labium.

The application of a solution of perchloride of mercury has proved successful for cancrum oris in the hands of Mr. E. C. Kingsford, at the Bolton Infirmary, and is well worthy of trial for noma pudendi (*vide* p. 156). The use of the actual cautery has given good results in some cases.

CHAPTER XXXIV.

DISEASES OF THE NERVOUS SYSTEM.

Inflammation of the Dura Arachnoid is dependent, as in adults, upon injury or disease of the bones of the skull. It is comparatively rare, and causes no special symptoms other than will be considered as those of meningitis. Meningitis is, indeed, usually associated with it; and one hardly meets with those more chronic forms of disease, or pachymeningitis, that are met with in adults. As a rare instance, however, of something of the kind, the first of the cases which follow may be given. The second case, while it illustrates the occurrence of local collections of pus in the arachnoid, also shows the liability which exists for a general meningitis to be set up under those circumstances.

A boy, aged four and a half years, was admitted to Guy's Hospital under Mr. Birkett, in 1874, for a swelling in each upper eyelid. Twelve months before his admission his eye began to swell; a month later the other eye did the same, and for three weeks before admission he had been very drowsy. He was admitted for the tumour over the left orbit, and it was then noticed that there was a hard cartilaginous body, freely movable under the skin, beneath the upper margin of the left orbit. His sight was unaffected, and the movements of the eyeball were perfect. His temperature ran up to 104° and 105° within a day or two of admission, and he died of pyæmia. At the autopsy the history of the case appeared to be this: There had been caries of the first lower molar, and abscess; then suppuration in the inferior dental canal, acute ostitis of the left side of the lower jaw, extension of the disease in the pterygo-maxillary fossa, and thence to the base of the skull. Having entered the skull by the foramina at its base, and having thickened and dissected up the dura mater from the base of the skull in the middle fossa and about the body of the sphenoid bone, it had entered each orbit, treated the periosteum of those cavities in like manner, and the tumour in the left orbit was in reality only a tough yellow mass, of inflammatory origin.

A female child of six months was brought for wasting of three weeks' duration. It was emaciated and pale, the veins of the head were distended, and the fontanelle, 1½ × 1½ inches, was bulging and pulsating. There is no note of any paralysis, but there were soft, elastic, tender thickenings over the lower halves of the right radius and ulna and left humerus, a state of things which, at this distance of time (nine years), sounds very like syphilitic disease of the bones, though it does not appear to have occurred to any of those who saw the case, myself amongst the number, to call it so. The child died with convulsions.

At the autopsy a large collection of pus was found between the dura mater and the right side of the brain. It extended from vertex to base, and from the anterior part of the middle fossa back to the horizontal branch of the lateral sinus. It did not enter the cerebellar fossa. Its wall was ochre-yellow, like a typhoid stool, but the pus itself was "laudable." Pus occupied the ventricles. The lateral sinus was plugged on both sides, the left by clot of older date than the right. There was no disease of the internal ear. The bones were slightly rickety.

A condition such as this is probably more often produced by disease of the bones of the middle ear, or of the petrous bone or mastoid cells as a consequence thereof, and careful search for such should be made at the post-mortem examination; but it may occur from pyæmic conditions, from the extension inwards of erysipelas, or from unhealthy inflammation of the calvaria, of the pericranium, and occasionally also, in the absence of all but emaciation, the disease may have originated spontaneously.

Intra-arachnoid hæmorrhage and pachymeningitis have been described by most writers, but such conditions are of rare occurrence, and are not peculiar to childhood. We have occasionally seen children who have died after several weeks or even months of semicoma with rigidity and occasional convulsions in whom post-mortem there was found extensive thickening of the dura mater chiefly at the vertex, with adhesions to the pia arachnoid and even formation of a kind of false membrane between the dura mater and arachnoid. There has been more or less extensive sclerosis of the cortex in these cases. The balance of evidence would appear to be in favour of a syphilitic origin for some at least of these cases, and this view may be confirmed by ophthalmoscopic examination; the choroid or vitreous may show distinct syphilitic changes.

It may be well to call attention here to the fact that, in young children, pressure upon the surface of the brain, whether by hæmorrhage or pus, as illustrated by the cases of arachnitis already recorded, seems less liable to cause paralysis than might have been imagined. Surface hæmorrhage or pressure is more likely to produce stupor with feeble circulation, and death either by convulsions or exhaustion, and this is a point of importance in diagnosis.

Meningitis in children usually affects the pia arachnoid; *i.e.*, it is a leptomeningitis, not a pachymeningitis. It may be said at once—and the remark is true of all forms of meningitis—that there is no distinction between meningitis of the brain and that of the cord. The membrane affected is one and the same, and disease of the membranes of the brain runs with perfect facility along those of the cord: any form of meningitis, whether tubercular or otherwise, may be, and very commonly is, *cerebro-spinal.*

There are three common varieties of meningitis met with in childhood:

(1) Tubercular Meningitis: much the commonest of the three.

(2) Suppurative Meningitis: secondary to some obvious source of infection elsewhere, and most commonly pneumococcal in origin.

(3) Simple Posterior Basic Meningitis: a primary disease, due almost certainly to a specific micro-organism.

Suppurative Meningitis is an affection chiefly of the convexity of the brain, but in many cases it affects also the base to a less extent, and the spinal cord is also affected in the majority of cases. When it is due to extension from disease of the petrous bone, or from other disease at the base, the meningitis may begin here.

The commonest cause of suppurative meningitis in children is pneumococcal infection, and a primary source is in these cases almost invariably found in some pneumococcal lesion elsewhere; it may be pneumonia, pleurisy, empyema, pericarditis or malignant endocarditis. The disease is also met with after injury, otitis (externa or media), ozæna; it may occur also after some acute illness such as scarlatina, erysipelas, influenza, or nephritis, and it has been noticed as one of the results of the pyæmic condition found in new-born children from inflammation about the umbilical sore. It occurs more often in infants than in older children.

The **symptoms** of suppurative meningitis are often very obscure; the child is usually already suffering from some severe illness, and the additional symptoms pointing to the cerebral complication may easily be overlooked. The occurrence of convulsions or delirium with vomiting, squint, stiffness of the neck, fulness of the fontanelle, and tremor, especially if these symptoms be associated with a high temperature and a very rapid pulse, may indicate the occurrence of suppurative meningitis in any of the diseases mentioned above. But in many cases, even in the light of a subsequent autopsy, it is difficult to see that there were any symptoms pointing specially to meningitis.

Such a case as the following is common enough: a child is under treatment for pneumonia and pleurisy when a convulsion unexpectedly occurs; there is slight rigidity, which passes off and leaves some weakness of one or other limb. Careful observation detects an occasional squint. The child is apathetic, the temperature is high, and the pulse rapid and irregular. Within four days from the onset of cerebral symptoms the child dies and the autopsy reveals greenish-yellow pus all over the brain and spinal cord, a thick layer of lymph over one pleura, and turbid serum with lymph in the pericardium. Bacteriological examination shows a pure growth of pneumococcus in the pericardial, the pleural and the meningeal exudation.

The following case exemplifies the occurrence of meningitis after otitis media:

A girl of seven had been ailing for a month, and deaf in the right ear: there had been no discharge. Subsequently there was high temperature, retracted neck, and strabismus.

The autopsy showed general suppurative meningitis, suppuration of the middle ear, on both sides, extending to the bone, and points of pus appearing on the internal table in many places. The membrana tympani was sound on both sides. I subsequently traced the suppuration along the bony part of the Eustachian tubes. There was chronic enlargement of one tonsil.

The course of this disease is almost always very rapid; a duration of less than a week, usually four or five days from the onset of cerebral symptoms, is characteristic of this form of meningitis; very rarely it lasts a few days longer. There can be little doubt that some at least of the cases where suppurative meningitis has been supposed to have lasted two or three weeks were in reality cases of the Simple Posterior Basic Meningitis described below.

Morbid Anatomy.—Over the vertex of the brain in the meshes of the pia arachnoid, and often at the base also, there is pus, which may form a continuous layer completely hiding the sulci. The anterior part of the vertex and longitudinal fissure is generally more affected than the posterior: the pus is generally thickest along the vessels. The posterior surface of the cord is generally more affected than the anterior, and the lumbar region more than the dorsal in this as in other forms of meningitis. The brain is often much softened: there may be some turbidity of the fluid in the lateral ventricles, but there is not much excess of cerebro-spinal fluid, nothing certainly approaching a hydrocephalus.

In cases due to extension from diseased bone, thrombosis of sinuses may also be present. One of the characteristic features of this form of meningitis is the presence almost invariably of some obvious source of infection elsewhere. Thus in fifteen consecutive cases of suppurative meningitis at the Hospital for Sick Children, Great Ormond Street, empyema was present in five, thick lymph on the pleura in three, pleurisy, pneumonia, ulcerative endocarditis and membranous colitis each in one case, necrosis of the petrous bone in two, and erysipelas in one. It will be noticed that the first five sources mentioned (found in eleven out of fifteen cases) were all conditions in which the pneumococcus is commonly found, and in several of the cases which were examined bacteriologically, as in the one quoted above, the pneumococcus was found both in the primary focus in the pleura or elsewhere, and in the meningeal exudation. In the cases due to ear disease various micro-organisms are found in the pus on the brain.

Diagnosis.—This form of meningitis is perhaps more often overlooked than any other. The symptoms are vague in many cases, and the primary disease, pneumonia, erysipelas, or whatever it may be, tends to mask the symptoms of meningitis; while, on the other hand, pneumonia, by the acuteness of its onset and the violence of its delirium, may easily simulate meningitis, and so also may the noisy delirium of typhoid fever.

Prognosis.—Is probably hopeless in all cases of suppurative meningitis. We have, however, once or twice seen cases in which severe ear disease was complicated by symptoms of acute meningitis, drowsiness, or irritability, vomiting, severe headache, and optic neuritis, in which after treatment of the ear trouble the meningitic symptoms completely subsided. When there is no evidence of thrombosis of the sinuses, one is left in doubt as to the exact nature of the disease, but some of these cases certainly look like a localised meningitis which recovers.

Treatment can only be directed against symptoms in most cases when the disease has appeared, but probably much may be done in the way of prophylaxis by the prompt treatment of the primary disease, particularly by early and free opening of empyemata, and thorough, not necessarily operative, treatment of disease of the ear. Counter-irritation and shaving the head are advised. Both are objectionable, and apparently useless. An ice-cap will do all that is necessary, and though of this also it must be said that no great value can be demonstrated, nevertheless it should be used, and, if possible, continuously.

Quinine is another remedy which may be given if the temperature be high; any violent delirium must be controlled by bromide, chloral, Dover's powder, or the succus hyoscyami. The membrana tympani should always, if possible, be examined when the cause of the disease is not beyond question, as there appears to be no doubt that on several occasions the symptoms have subsided after its incision and the evacuation of a small quantity of pus.

Otitis of the Middle Ear.—Is supposed usually to spread from inflammatory affections of the fauces, and does so in some of the many catarrhal affections of this region. But it occurs often without any demonstrable source for its propagation, and it is not unlikely that it may originate spontaneously. As regards meningitis, it is difficult to prove that it may result from a mere purulent catarrh of the middle ear unless there is also disease of the petrous bone. In ninety-four consecutive autopsies, excluding meningitis of every description, at Great Ormond Street, we found pus in one or both ears without perforation of the drum and without any evidence of bone disease forty-nine times. It is, in fact, so common to find pus or muco-pus in the middle ear without any perforation of the membrana tympani, and without any bone disease, in children who have died from quite other causes, that its presence in any particular case of meningitis by no means warrants the assumption too often made that the meningitis resulted from it.

Posterior Basic Meningitis (Chronic Basilar Meningitis) has only comparatively recently been recognised as a form of meningitis which is quite distinct both clinically and pathologically from ordinary secondary suppurative meningitis on the one hand, and from tubercular meningitis on the other. Barlow and Gee in 1878 drew attention to it under the head of "Cervical Opisthotonos in Infants," and since that time Barlow and Lees, and also Dr. W. Carr, have done much to increase our knowledge of this form of meningitis.

This disease is almost limited to infants, chiefly in the first year, often within the first six or nine months of life, a period at which tubercular meningitis is much less common. A distinct seasonal variation is noticeable, the disease being more prevalent in the earlier months of the year than in the later. It is sporadic in distribution.

The cause of the disease is a diplococcus, which is probably identical with the so-called "Meningococcus," the diplococcus intracellularis. The same micro-organism has also been demonstrated in the peri-arthritic exudation which occasionally occurs as a complication of this form of meningitis.

It would seem that this disease bears a close relation to that known as "epidemic cerebro-spinal meningitis," if indeed the two be not identical: and many writers nowadays describe the sporadic disease to which we are referring as "sporadic cerebro-spinal meningitis."

Symptoms.—Stated briefly, the characteristic features of this disease are, a chronic course, marked head retraction, and usually, but by no means always, a fatal result.

To deal with the symptoms more in detail, the onset is generally more or less acute; as in many other diseases, the parents may state that the child had a fall shortly before the disease began, or it may have had a slight "cold," or some other ailment to which the illness is attributed, but no one of these is constant.

The first symptom noticed is in many cases the head retraction; in others a convulsion or vomiting comes first, to be followed in a few days by rigid retraction of the head. This retraction varies somewhat in degree in individual cases, and also from day to day, but it is usually the striking feature of this disease, and it is sometimes so extreme that the occiput almost touches the buttocks.

With this opisthotonos there is associated in many cases rigidity of the limbs: the arms are often fully pronated and rotated inwards, so that the palms of the clenched hands look outwards: the shoulders are drawn back, and there is a tendency to rigid adduction of the legs.

In a considerable proportion of the cases there is complete blindness, which is difficult to explain, as it is extremely rare to find any optic neuritis or atrophy in this disease, and in cases which have recovered the blindness has disappeared.

As in other intracranial lesions, champing movements of the lower jaw and grinding of the teeth are often present. The fontanelle is generally full, and after a few weeks the head is noticed to be increasing in size, and if the child lives, as many do, for three or four months, there may be considerable hydrocephalus.

The temperature at first is usually moderately raised, in some cases it continues irregular for two or three weeks, but perhaps more often it falls in a few days, and remains normal, or only slightly above the normal. The pulse and respiration are generally regular, and unless the temperature be raised, may be normal in rate. Tache cérébrale and retraction of the abdomen are not marked features of this disease. There is seldom any squint, and the absence of paralysis of cranial nerves and of the limbs is very characteristic of this form of meningitis. The knee-jerks are often brisk, but otherwise unaltered.

For weeks the child lies on its side in an apathetic condition, but by no means unconscious; its head is drawn back, its eyes vacant, its limbs rigid. If disturbed, and especially if its head be pushed forward, the child screams as if in pain, but otherwise it lies quietly. There is gradual wasting; the food is taken badly, and there is vomiting more or less throughout the disease. The enlargement of the head slowly increases, the child becomes weaker and more emaciated, and dies apparently of exhaustion.

Morbid Anatomy. — The post-mortem appearance of simple posterior basic meningitis varies very much according to the period of the disease at which it is seen. In the early stage it consists of an exudation of lymph in the pia arachnoid limited usually to the base of the brain, and affecting particularly the reflection of arachnoid which passes from the medulla to the cerebellum. The exudation extends along the base as far forward as the optic chiasma, sometimes into the Sylvian fissures, and generally there is a patch on the anterior inferior extremity of the temporo-sphenoidal lobes. Rarely there is a trace of exudation along the vessels almost up to the vertex, but as a rule the vertex is free. The exudation usually extends down the cord to the lumbar region.

The cerebro-spinal fluid is turbid, and there may be a collection of lymph at the bottom of the ventricles, the ependyma of which is perhaps injected or opaque. Adhesions rapidly form between the medulla and the cerebellum, and often also between these and the neighbouring dura mater, and lead to blocking of the foramina of Majendie and Luschka, so that even when death occurs within two or three weeks of the onset the ventricles are usually dilated.

It is in this early stage that the disease might be, and probably has been, confused with the ordinary secondary suppurative meningitis, from which it is distinguished not only by its clinical course, its localisation, and its bacteriology, but also by the characteristic absence of any obvious source of infection in the viscera or elsewhere. This absence of any affection in the body elsewhere, except such complications as may occur just before death in any prolonged illness, is very striking in this disease, contrasting markedly both with suppurative and tubercular meningitis.

In the later stage the exudation is disappearing to be replaced by dense fibrous thickening and opacity of the pia arachnoid at the base of the brain and on the spinal cord. The medulla is adherent to the cerebellum by firm fibrous adhesions, and the arachnoid reflection between the medulla and cerebellum may be converted into a thick opaque layer of fibrous tissue. All trace of lymph may have disappeared in this late stage, and this is perhaps the commoner appearance, as death is often delayed for two or three months after the onset of the disease. Evidently, therefore, there is a tendency to recovery, which, unfortunately, is too often prevented by the adhesions between the medulla and cerebellum, which in the later cases have already produced more or less hydrocephalus, to which death appears to be due.

We may mention here a curious complication which is occasionally seen in this disease. Redness and swelling about one or more joints has appeared, generally during the earlier stage of the disease. The condition closely resembles an arthritis, but is found to be due to exudation of lymph around, not in the joint. More than once we have known incisions made with the idea that pus was present, but none has been found: the lymph, like that on the brain, is of a thick plastic character, and is, moreover, very slight in amount. The peri-arthritis seems to subside completely if left alone.

Prognosis.—Of the three forms of meningitis, this is the most hopeful, perhaps the only one in which there is any hope of recovery. Quite an appreciable proportion of cases get well: but perhaps of these most have some permanent damage left: some are hydrocephalic, some are idiots, some are weak-minded, only rarely is there complete recovery. Such a case where recovery might have seemed hopeless was under the care of Dr. Taylor. For weeks a child of about two years old lay apparently blind with retracted neck, and to all appearance dying—its powers were so feeble and the nourishment taken so little; yet it lived on, and was, no doubt, of robuster material than we gave it credit for, for a subsequent attack of scarlatina did not prove an extinguisher; and now it is in good health!

The duration of the fatal cases varies considerably. Death seldom occurs in less than three weeks, more often it is delayed for six and seven; and in many cases the fatal result only occurs three or four months after the onset of the disease, death being due in these cases rather to the secondary hydrocephalus than to the meningitis.

Diagnosis.—This disease is most likely to be mistaken for tubercular meningitis. The chief points of distinction are the marked head retraction, the blindness, the slower course, the absence usually of paralysis of cranial nerves and of optic neuritis, and the supervention of hydrocephalus in the simple posterior basic disease. We wish to emphasise the fact that any considerable degree of persistency of head retraction is quite the exception in tubercular meningitis, in which it is more common to find only some stiffness of the neck. The presence of marked head retraction in a child with other symptoms of meningitis is primâ facie evidence *against* tubercular meningitis.

Suppurative meningitis differs in its very rapid course, the presence often of paralysis of cranial nerves or of limbs, the absence in most cases of marked head retraction, and last but not least, in the presence almost invariably of some obvious primary disease elsewhere.

Marked and persistent head retraction is the characteristic symptom of posterior basic meningitis, but it must be remembered that some head retraction is not unfrequently seen in infants with no cerebral disease at all. An attack of otitis, or the irritation of teething, may produce definite head retraction, and the head is often thrown back considerably in cases of pulmonary disease with much dyspnœa, as if the extension of the neck, perhaps by fixing the upper part of the chest, assisted respiration.

In meningitis there is no symptom which is infallible; there are no two or three which will not *sometimes* play us false; but the most reliable are, retracted head, fever, causeless vomiting, irregularity of the pulse, retraction of the abdomen, and muscular rigidity or weakness.

A child of two years, in Guy's Hospital, well illustrated the difficulties which beset the diagnosis of meningitis. He had had a discharge from the left ear for some weeks, but this had ceased a fortnight before his admission, and coincidently he had become stupid, with occasional vomiting and pain in the head. He was admitted with an irregular pulse, a markedly retracted abdomen, tache cérébral, constipation and retracted neck. There was constant muttering, broken only by an occasional cry; but he had a bright eye and did not suffer from intolerance of light. The vomiting did not recur after his admission, but in other respects he remained in the same condition. The optic discs were perhaps a little cloudy. It became more and more difficult to feed him, and he ultimately died in a peculiar kind of fit, of which he had previously had one or two, and in which he became blue and ceased to breathe.

I confidently expected to find meningitis, but Dr. Carrington could find no disease of any kind except a little muco-pus in the left ear and a caseous gland or two in the mediastinum.

At the present day puncture of the spinal membranes in the lumbar region is sometimes resorted to as a means of diagnosis between the different varieties of meningitis, and it is possible that it may occasionally be of some practical value, but when the symptoms are sufficient to establish the existence of a meningitis. the particular variety—as far as we know at present—is a matter of little moment, as it hardly, if at all, affects treatment.

It must be added that lumbar puncture is not entirely free from risk: apart from the possibility of septic infection of the spinal membranes where they are not already infected by diseases, cases have been observed of sudden death following immediately on lumbar puncture.

Treatment.—Beyond care in the prevention of bedsores, and in the maintenance of nutrition, little can be done. Iodide of potassium has been given, mercury has been administered by inunction and by the mouth, and although it is seldom that any good results, yet in the hope of assisting absorption of the inflammatory exudation such treatment may well be continued. Cod-liver oil is certainly useful, at any rate in maintaining nutrition. In all cases, and especially in the more chronic ones, careful feeding is a great necessity. There may be difficulty in swallowing, and the bodily conditions are such that any slight broncho-pneumonia is too likely to prove fatal. No more food must be given than can be readily swallowed, and the position must be such that it can be readily taken. To see a child lying flat on its back, and the food tilted in at the angle of the mouth by gushes, is to foretell a spluttering and insufficient meal, and the probable termination of the case in broncho-pneumonia. Such cases are best fed through the nose either by passing a catheter along the floor of the nostril into the stomach, or perhaps better in some cases, by slowly syringing milk or other liquid food into the nostril.

Recently various surgical methods of establishing artificial drainage of the ventricles have been attempted, but with hardly sufficient success hitherto to encourage one to adopt them.

CHAPTER XXXV.

TUBERCULAR MENINGITIS.

Tubercular Meningitis has sometimes been called *acute hydrocephalus*, but the name is misleading; at any rate, effusion of fluid is no prominent feature in the result.

Tubercle attacks the brain in two ways—as a diffused and more or less acute granular inflammation of the membranes, and as a localised yellow mass or tumour. For some reason, not easy to give, the tubercular tumours are more often situated in the cerebellum or pons. These two forms may be found separate or associated, and every now and again intermediate conditions are met with which make it impossible to separate the two.

For instance, in the Sylvian fissure, perhaps, the grey tubercle may be unusually abundant, and the individual granulations large. Some of them may be distinctly yellow. Sometimes the granules reach the convexity, and, massing themselves into a yellowish layer, spread over the surface of some of the convolutions; sometimes small yellow nodules are scattered over the brain in the depths of the sulci, and are found on making vertical slices of the cortical structure. The appearance of the tubercular nodule is worth noting: it is invariably surrounded by a grey gelatinous zone of soft vascular material, very similar to the grey gelatinous material sometimes seen in cases of pulmonary tuberculosis. This is the growing tubercle. There is, therefore, in the brain, an exact counterpart of pulmonary tuberculosis in all its stages, even to that of the chronic disease being a frequent cause of acute miliary tuberculosis—*i.e.*, of tubercular meningitis.

The brain is usually soft, the central parts may be almost diffluent, in tubercular meningitis, and there may be, usually is, a slight excess of cerebro-spinal fluid at the base and in the ventricles ; but this excess is, as I say, no striking feature, and hardly warrants such a confusing term as " acute hydrocephalus." Occasional conditions—such as patches of red softening or acute encephalitis, punctiform hæmorrhages, or even, though very rarely, a large extravasation of blood—may be met with, either in relation to a growing tubercle or to some secondary thrombosis of one of the vessels.

As regards the spinal cord, it is no uncommon thing to find it affected in the same way as the base of the brain. It follows the rule we have above laid down, that there is no distinction between the two parts. The affection is not always present ; occasionally it may be spinal and not cerebral, but it is very commonly both. It is important to remember this in a disease of so insidious an onset as tuberculosis : there are cases in which the symptoms are chiefly spinal, such as general hyperæsthesia, muscular and other pain simulating joint disease, or the pain in, and retraction of, the neck already alluded to in simple meningitis. These things may serve to suggest a spinal affection in the absence, and frequent absence, of cerebral symptoms.

One other point, which has of late been made much of, is the frequency of the existence of tubercle of the choroid. Dr. Angel Money found that of forty-two cases of tubercular meningitis choroidal tubercle was present in fourteen ; in two others it was present—once with a tubercular mass in the cerebellum, once without any cerebral tubercle of any kind. Our own experience, however, leads us to think that tubercle of the choroid is rare except where the tubercular meningitis is part of an acute miliary tuberculosis. In these cases, as we have already pointed out, it is the rule to find tubercles in the choroid.

The **histology** requires little mention, it is almost beside the purpose of this book ; but the details of tubercle may be well worked out in the pia mater, and perhaps better than in other places in some respects, for here of all parts it has such a plain association with the peri-vascular sheaths. The giant cells and reticulum are generally well seen. As regards the presence of the bacillus tuberculosis in these cases, one can only say that, although its causal connection with the disease is undoubted, we have several times failed to find it in cases of pure miliary tubercle of the pia mater—that is, in cases in which no softening or degenerative changes had occurred. It is not altogether easy to give an explanation of the scantiness of the bacilli in the miliary nodule of acute tuberculosis. One would have supposed that the bacillus being the cause of the tubercle the specific virus would be abundant in proportion to the acuteness of the disease, whereas their abundance is rather in proportion to the degenerative changes in the products of the disease.

As regards its association with disease elsewhere, it seems to me that cheesy bronchial glands and a subsequent dissemination of miliary tubercle in the lungs, viscera, and pia mater, are by far the most frequent occurrences. But it is found with other conditions also, such as disease of the spine or chronic disease of the bones and joints. It may, of course, be the sequel of chronic phthisis, or mesenteric disease, although these and other conditions appear to be far less frequent. If the cases of tubercular meningitis spreading from yellow masses in the brain itself, together with those in which it is secondary to caseous disease of the mediastinal glands, and those in which it is due to chronic bone disease, be subtracted, I think that the remainder, whether from scrofulous kidney, chronic phthisis, tabes, &c., would form a very small proportion of the total. The amount of disease in the glands is, of course, variable. It may be confined to the mediastinal glands, or it may infect those above and below the thorax, and even those in other parts; and, in the same way, the accompanying disease in the viscera is very variable—the liver, spleen, and kidney may look quite natural, except a scattered distribution of small grey grains with ill-defined margins visible beneath the capsule; or there may be larger nodules, either in spleen or liver, becoming cheesy. In the kidney the nodules increase, not so much by a circumferential addition as by running downwards in a streaky way towards the pyramids. All three of the solid viscera are in some cases affected by an infiltration rather than by a nodular growth; they then increase much in size and put on a peculiar mottled appearance, which is strikingly abnormal. The liver is not infrequently studded with nodules of some size, which on section show a dilated bile-duct containing often retained and perhaps inspissated bile. Tubercle in the liver runs along the portal canals, and thus comes to surround the biliary canals, and there is this practical import attaching to it, that tuberculosis in a child is sometimes attended with moderate jaundice.

Softening of the stomach has been described as a frequent lesion in tubercular meningitis. I have never observed any such change myself, or indeed anything that could not be ascribed to simple post-mortem solution (*vide* p. 147).

The disease may occur at any age. Of thirty-three deaths, one occurred at three months, three at six months, one at nine months, three at twelve months, four under two, three under three, six under four, four under five, one under six, four under seven, and three at eight, ten, and twelve respectively.

The course of the disease averages three weeks, but it may be rather more prolonged, and is occasionally much shorter. The duration is, however, difficult to fix; for, as with the earlier days of typhoid fever, the onset often passes without recognition.

Symptoms.—Malaise, wasting, bad appetite, restless nights, disturbed by startings and a harsh, painful, short cry, bad dreams, pain in the head, confined bowels, and some irregularity of pulse. The child is usually paler than natural, but apt to flush suddenly with an unnatural flush. These are the symptoms of the onset, and, as needs no saying, they are so indefinite as to give very little help. With such symptoms as these only one is in danger either of being too foreboding, and of condemning many to tubercular meningitis where there is some fleeting gastric disturbance, or else of treating as trifling what will end in speedy death. Nevertheless, things can hardly be stated more definitely. As the disease matures the cerebral excitement becomes more intense, and the special senses suffer exalted sensibility. Thus it is that the child avoids the light, starts at sounds, and cries if disturbed by movement. The symptoms now are vomiting, retraction of the abdomen, intolerance of light, fever, general hyperæsthesia, stiffness of the neck or other muscles, irregular and sometimes well-marked Cheyne-Stokes' respiration, strabismus, convulsions, coma, and a pulse which becomes very rapid.

It is usual to describe tubercular meningitis as a disease of stages. The first, of brain irritation, in which headache, vomiting, constipation, retracted abdomen, quick irregular pulse, excitement, delirium, and convulsions are the chief symptoms; the second, of brain pressure, with pupil symptoms, coma, facial or other local paralysis, hemiplegia. and slow pulse, in addition;

and in the third, the paralysis increased and more general, the pulse again quickening and becoming running, the temperature perhaps falling, but the coma continuing. But the difficulties of the student lie in the stages being confused; in many of the symptoms being absent. Nor is the teacher much better off; for added experience only makes it increasingly clear to him how treacherous is the disease, and how impossible in some cases it is to avoid mistakes. Nevertheless, a careful watch of a suspected child will do much towards replacing doubt by certainty.

The child that is hatching tubercular meningitis not only wastes and loses appetite, and becomes pale, but he often changes in disposition, and becomes cross or fretful, with frequent complaint of his head or of being tired. He will show a dislike to all noise; perhaps he will walk with care, as if his neck were stiff; or totteringly. There may be some slight tremulousness of his arms, an irregular twitching, such as one sees from other causes, sometimes in uræmia. As the disease progresses, there is causeless vomiting, unconnected with feeding, and irregular in its onset. The later symptoms are—more headache, perhaps drowsiness or stupor, a high temperature, though usually an oscillating one, and, in the paralytic stage, there may be either general convulsions, tonic spasm of one arm or the other—or of both legs, or the whole of one side—or clonic convulsion. The pulse may be slow after the first onset, but usually rises again as death approaches.

When convulsions come on the fatal termination is not usually long delayed. The case may drag on for three weeks or so in an indefinite way, and the marked cerebral symptoms, either convulsions or coma, be not more than two or three days in duration; and there are cases in hospital practice where the prodromal stage has been altogether overlooked. The child is perhaps brought for convulsions, which have ushered in the final stage, and death occurs within a short time of admission. Local paralyses are not uncommon, particularly of the sixth and facial nerves. Paresis of arm or leg, or of both, is common, but complete paralysis is rare.

In young children, before the fontanelle has closed, there may be bulging, the surface veins may be distended, and there may be evident head pain denoted by the restless knocking of the head with the hands, or, when the child is asleep or in its cot, by the frequent harsh cerebral shriek which is so painful to the hearer.

The optic discs should in all cases be carefully examined for changes at the fundus. But in the majority of cases these are not marked, and would pass unrecognised by any but the most skilled observers. There is even a difference amongst those most competent to form an opinion—some averring that changes may be seen in many cases, others that they are exceptional. The morbid changes are of two kinds: (1) Evidences of swelling and inflammation; (2) The presence of choroidal tubercle. The latter is unquestionably rare. As I have already said, there is every probability of tubercle existing in the choroid, either as minute grains, to which Sir Thomas Barlow has applied the term "tubercular dust," after Rilliet and Barthez; or in larger tubercles, but which pass unrecognised during life. I have lately had a case in the Evelina Hospital where there were many in each eye; one, in the neighbourhood of the yellow spot in the left eye, had a central glimmering whiteness, surrounded by a dark blurred halo, which might well have passed for a patch of choroiditis of some date. All the others were far less pronounced departures from the normal tint of choroid. They seemed as a pearly or grey pallor of it, hardly to be called swollen, yet to careful sight the vessels were blurred, narrow, and distorted, while one or two of the spots were noticeably perfectly circular. The woodcuts on page 514 depict some of the appearances of the tubercular deposits in the choroid. They have been drawn by Mr. Lapidge from sketches made by Dr. George Carpenter of cases at the Evelina Hospital.* It is more common, however, by far to be able to detect some increase in size or tortuosity of the veins, some alteration of the vessels from day to day, some swelling of the disc, or slight cloudiness, or lymph-like grains about its edge, which tend to obscure the vessels. Of the frequency of these appearances there must of necessity be different opinions; as regards their value, if present, some latitude must also be allowed to individual observers. The conclusion will necessarily depend upon how much range is allowed for the variations in the appearances of the normal disc. In my own cases, however, I may say that pronounced changes of any kind have been quite exceptional. For a statement on the other side, it may be said, that Dr. Garlick, in some observations made at the Ormond Street Hospital, found them in 88 per cent. of the cases.*

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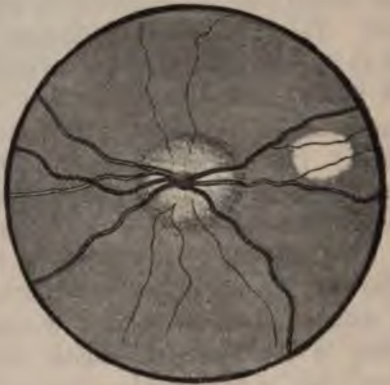
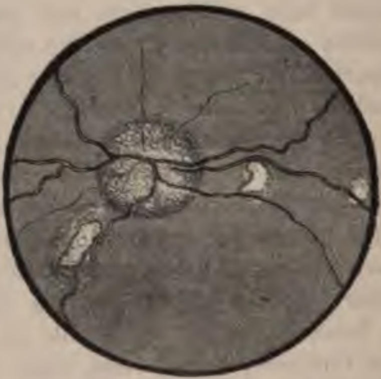
* Dr. Carpenter has collected several cases in a paper on this subject, in the *Illustrated Medical News*, Dec. 1889.



From a Girl of 3 years.



From a Girl of 6 years.

The **Temperature** chart of tubercular meningitis is likely to show considerable excursions. Of twelve cases, it was over 105° in three, and in a fourth ran up to that height at death. In two others it went to 104°. In three it was not over 100.5°. The oscillations are often considerable; even as much as three or four degrees. The highest point reached daily occurs at variable times; sometimes it is in the morning or it is high both night and morning, or one day at night and another in the morning.

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* *Med.-Chir. Trans.*, vol. lxii. p. 441.

Of the many symptoms, some are more reliable than others. Of these are, irregularity of pulse and respiration vomiting for which no cause can be assigned, intolerance of light, headache if accompanied by retracted abdomen, stiffness of the neck, and hyperæsthesia of the surface. Strabismus and convulsions are, of course, equally reliable in their place; but they usually come at a time when doubt is giving place to certainty.

Diagnosis.—Typhoid fever is the great difficulty; in it even strabismus has been known to occur, as if to make the symptoms of the two diseases exactly similar. If, after paying all attention to the previous history and surroundings of the patient, there is still doubt, one must withhold one's judgment. Retraction of the abdomen, hyperæsthesia, and irregularity of the pulse, are here especially valuable indications. Vomiting fails us, as it may be present and severe in early typhoid; still, in meningitis, it is usually erratic rather than urgent, as in typhoid fever. Constipation is of little value, it is so often present in typhoid fever; but it and retraction of the abdomen are not common together in the last named. The splenic enlargement sometimes gives a hint. The *tache cérébrale* is found under such a variety of conditions as to be of little use.

From *suppurative meningitis* it often cannot be distinguished with any certainty, especially in the cases where tubercular meningitis runs a more rapid course than usual; but the suppurative disease is likely to be more sudden in its onset, and the presence of some local source for the affection may assist the diagnosis. In the case of mastoid disease even this will not help us, for the ear trouble and the resulting meningitis are not uncommonly tubercular.

From *posterior basic meningitis* the distinction is not always easy, but there are certain points by which a diagnosis can usually be made. The head retraction of that disease is altogether more marked than in tubercular meningitis, in which, if present at all, it is usually only very slight, scarcely indeed more than a little stiffness of the neck. Paralysis of cranial nerves is the exception in posterior basic meningitis, it is the rule in tubercular. The slow and irregular pulse of tubercular meningitis is wanting in the posterior basic disease. Ophthalmoscopic examination may sometimes assist, rarely by the presence of tubercle in the choroid, more often by the presence of optic neuritis, which is not uncommon in tubercular meningitis, but very rare in the posterior basic form.

The age of the patient is to be considered; within the first six or nine months of life posterior basic is more common than tubercular meningitis.

And lastly, the course of the disease will often settle the diagnosis; the posterior basic disease frequently lasts three or four months, whereas tubercular meningitis seldom lasts more than six weeks.

Steiner notes that it may sometimes require the greatest skill to distinguish between meningitis and chronic hydrocephalus. I have seen the mistake made, and made it myself. A case of hydrocephalus terminated in meningitis, of a few days duration; but although the cerebral symptoms were not unlike those of meningitis, yet the temperature was persistently low throughout the illness and until just before death.

It may sometimes prove difficult to decide at the moment between tubercular meningitis and acute gastric disturbances. Attention must be given to the previous state of health—tubercular troubles maturing slowly, gastritis suddenly. Moreover, the latter is wont to occur at the time of dentition, and to be associated with a foul tongue; whereas a tubercular meningitis is frequently ushered in by a clean tongue.

In some cases of tubercular meningitis the prominent symptom is the obstinate constipation; and in association with the vomiting this may even suggest intestinal obstruction. We have even known laparotomy to have been suggested under these conditions.

Pneumonia, especially apical pneumonia, may closely simulate meningitis, and in cases where the physical signs are slight the diagnosis may not be easy. The sudden onset, the hot pungent skin, the rapid respiration, and the regularity of pulse are points in favour of pneumonia.

Prognosis is as grave as it can be; but instances of recovery are recorded, and, in this regard, we have frequent opportunities of noting an important piece of evidence, for it often happens that *yellow* tubercle in the brain has obviously been where it is found a long time, and yet has caused no symptoms. We have evidence, then, that masses of tubercle, which have been slowly growing, may give rise to no symptoms; and that simple meningitis has repeatedly recovered. There seems, therefore, no reason why tubercular meningitis should not occasionally recover, and there is some evidence that it actually does so. Rilliet and Barthez, Meigs and Pepper, and Clifford Allbutt, all concur that such a thing occasionally happens. I believe that I have myself seen a case of the kind. We can hardly reach much more than the *belief*, because recovery precludes the verification, and there must always remain behind a doubt whether the case might not have been one of simple meningitis. Gowers says on this head: "In tubercular meningitis there is very little hope in any stage that the patient will recover. But the patient has some small chance of recovery in simple meningitis, and perhaps (although still slighter) in tubercular meningitis, and, moreover, the very important fact must be borne in mind that the diagnosis between the two, and between these and meningitis secondary to obscure adjacent disease, is a matter of probability only, however high the probability may be. Hence it is not right, in any case, to assert the certainty of a fatal issue." *

Treatment.—Iodide of potassium should always be given, in the hope that, under its use, the symptoms may possibly ameliorate. The liquor hydrarg. perchlor. may also be given, in twenty- or thirty-drop doses, or more. It may act as a promoter of absorption of inflammatory products, and it is not a form of mercury which has any apparent harmful action upon children. Here, also, I have tried iodoform internally, in quarter- or half-grain doses, in very young children; increasing it cautiously, if necessary, to gr. j, or even more. As I have already said, it requires watching, as it occasionally makes them sick and does harm. I have not seen any marked good effect from its use.

The child should be kept in bed, and perfectly free from excitement of any kind. An ice-cap should be applied to the head; the bowels acted upon once a day; and any headache or sleeplessness mitigated by bromide of potassium, chloral, or opium. The diet should be nourishing and easily digestible, in the shape of eggs, milk, jellies, custards, &c.

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* "Diseases of the Nervous System." vol. ii. p. 324.

Children with hereditary tendencies to phthisis, or those who look tuberculous, should be carefully watched and guarded. They must be kept warm, live as much as possible in a dry air, upon porous soil, and the development of the brain be delayed by keeping them away from books. A tuberculous mother should not nurse her child, but let it be fed artificially or by a wet nurse.

Tetanus: Trismus Neonatorum.—Tetanus is but rarely seen in children. It occurs, however, occasionally in new-born infants, probably as a result of infection through the raw surface of the umbilical cord. The possibility of serious results from this source must never be forgotten in the care of the new-born; the cut surface of the umbilical cord is to be protected with as much antiseptic care as any operation wound. Not only tetanus, but erysipelas, to which new-born infants are perhaps particularly liable, wound-diphtheria, and also pyæmia, may result from neglect of proper antiseptic precautions.

The onset of tetanus neonatorum is hardly ever delayed beyond the ninth day after birth. The symptoms are very similar to those seen in adults. The inability to take the breast, owing to the trismus, may be the first symptom which attracts attention. The limbs become rigid, and the face contorted at intervals by the spasm; the back is rigid, and the head perhaps retracted. The spasms increase in frequency, feeding becomes more and more difficult, and the child dies of exhaustion or of respiratory difficulty.

In these infantile cases death usually occurs within ten days. Out of 31 fatal cases collected by Dr. Lewis Smith,* 24 died within two days after the onset, but recovery has occurred even after the tetanus has lasted three or four weeks.

In older children tetanus occasionally occurs, and in them, as in the new-born, the disease varies much in severity; for instance, a girl, aged seven years, ran a nail into her foot. A few days later symptoms of tetanus appeared, and the child died within forty-eight hours. A boy, aged ten years, with an exactly similar accident, had symptoms of tetanus for several weeks, but slowly recovered; the infantile cases are, however, usually fatal in a week or ten days.

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* *Archives of Pædiatrics*, vol. xii. p. 905.

Treatment.—Chloral has proved useful in some cases. It should be given in doses of half to one grain every two hours, or even every hour, by the mouth, or if the spasm is so severe as to make it impossible to give medicine in this way, it may be administered by rectum in doses of two or three grains. Holt records recovery in an infant with potassium bromide, eight grains given every two hours for three days, and afterwards in smaller doses. When the spasms are very severe the inhalation of chloroform may be tried.

We have not had an opportunity of trying the tetanus antitoxin in infants, but good results have been reported. The antitoxin can be obtained from the Lister Institute of Preventive Medicine. Nasal feeding may be necessary, if there is much spasm of the masseters.

CHAPTER XXXVI

HYDROCEPHALUS.

Hydrocephalus.—I dismiss the term "chronic hydrocephalus," because it is misleading. Hydrocephalus has often been a bugbear with students, because of the difficulties which have been made to exist by a description of three so-called varieties—acute, chronic, and false hydrocephalus. Acute hydrocephalus has been accepted as synonymous with tubercular meningitis, but in the preceding chapter I have pointed out that the effusion is usually of subsidiary importance, it is so small in quantity. The diagnosis is not made by the evidence of excess of the cerebro-spinal fluid, but by the evidence of inflammation of the membranes of the brain. Cerebro-spinal fluid is often in excess, but it is mostly a moderate one, and there are many reasons for questioning the influence of the fluid in the production of a fatal result. But both in this and in simple meningitis, particularly when of a more chronic form and associated with the formation of a large quantity of sero-purulent fluid, the ventricles may become somewhat rapidly dilated, and be so found at the post-mortem; and probably, the younger the child the more likelihood will there be of this.

False hydrocephalus is a perfectly distinct affair, and is simply a state of depressed circulation and stupor, the natural result of exhaustion.

Hydrocephalus is a disease which occurs under limited and definite conditions, and it is one which has fairly constant symptoms. As with all other diseases, these are sometimes less clearly marked than at others, and the diagnosis may be mistaken or doubtful; but difficulties in diagnosis are not peculiar to it, it shares them with every other disease that can be mentioned. By hydrocephalus I understand an equable enlargement of the cavity of the skull by fluid within the cerebral ventricles, and by which it tends to become more globular. The globular shape is somewhat interfered with by reason of the union with the facial bones in front, but, wherever it is possible, bulging takes place—at the fontanelle, which becomes much increased in size, at all the sutures, and at the roof of each orbit. Thus the breadth of skull increases from side to side, the frontal bones become protruded forward and expanded, the eyeballs are prominent and their axes divergent. Within the cranium the brain is converted into a cyst, the larger in proportion to the dilatation of the ventricles by the accumulated fluid. The cortex cerebri lies everywhere in contact with its case. A distinction is made between external and internal hydrocephalus—in the one case the fluid being outside the brain, between the skull and it, in the other internal. I shall allude to the external form presently, but now it will be sufficient to say that the internal hydrocephalus is the common form, and I doubt whether the external should receive the name of hydrocephalus at all. Hydrocephalus, then, is usually a cystic expansion of the brain by fluid within the ventricles, so that, if we were about to remove the fluid by tapping, it would be necessary to pass through the skull or its membranous equivalent, the dura-arachnoid, the pia-arachnoid, and the grey and white matter of the cerebral cortex, to get at the fluid.

The bones of the skull in such a case are usually thin, sometimes so thin that there may be craniotabes. The fontanelles and sutures are perhaps widely gaping, or filled up more or less by the formation of Wormian bones.

Hydrocephalus when congenital is not infrequently associated with congenital malformations of one kind or another, thus it is sometimes accompanied by talipes, sometimes by spina bifida and spinal meningocele, and we have seen with it a curious patch of deficiency of the choroid symmetrically placed in each eye, suggesting congenital defect here, we have also seen supernumerary fingers and such like deformities associated with it.

Morbid Anatomy.—The brain is more or less expanded nto a loculated cyst by the dilatation of all the ventricles and the iter. In extreme cases the cortical layer becomes so thin that it is impossible to remove it without laceration. If this can be done, and it be taken out with a sufficiency of fluid in the ventricles, the appearances at the base may be somewhat peculiar from the dilatation of the third ventricle and the infundibulum. A thin-walled transparent cyst is seen, upon which the optic nerves, corpora albicantia, &c., are perched. Sometimes the optic nerves are œdematous. The lining membrane of the ventricles may perhaps be a little thickened and tough—it is sometimes as it were dusted over with sand—but its appearance is otherwise normal. These conditions are important, because they serve to explain one or two clinical facts. In the first place, the extreme swelling of the parts about the optic tract and the chiasma may serve to show why there should be, as there is sometimes, white atrophy of the optic discs and blindness. The dilated condition of the fourth ventricle may suggest why such cases sometimes die suddenly. The fourth ventricle is sometimes so much dilated that all the parts become stretched over it, and the circulation through the medulla and pons must necessarily be disarranged, and the nutrition of those parts be feeble.

The morbid changes which lead to hydrocephalus are not many, and their action is easily intelligible. I will place them in what is, perhaps, their common order of occurrence :

(1) Tumours about cerebellum, pons, or tentorium.
(2) Chronic inflammation about the medulla and cerebellum, leading to adhesion about the margins of the foramen magnum.
(3) Congenital malformation.

These no doubt act in one or two ways. They may press upon the veins of Galen and the straight sinus, or they may close the communication between the interior of the ventricles and the rest of the sub-arachnoid space. It might be thought that the pressure upon the veins, and the obstacle thus produced to the return of blood from the choroid plexuses, would be a sufficient and readier explanation of all cases ; but it seems clear from the occasional occurrence of congenital malformation, or the post-congenital adhesion and blocking of the aqueduct of Sylvius, that the mere closure of the ventricles is sufficient for the production of the affection. The hydrocephalus of posterior basic meningitis is associated with and perhaps produced in this way by adhesions between the medulla and cerebellum, blocking the exit from the fourth ventricle. Of chronic inflammation about the cerebellum and bulb I would further say that it not improbably originates in a variety of causes: there is the simple posterior basic meningitis of infants which we have described above; there is probably also a syphilitic form of leptomeningitis;* there are the insidious forms of meningitis which keep company with bad hygiene and the exanthemata; there is the group dependent upon otitis of the middle ear; and lastly, I would least of all exclude injuries to the head, for although, in the popular estimation, infants are providentially provided with bones that seem little liable to break, it cannot be said that they possess brains which are equally callous to bruising. Other causes are mentioned, such as inflammation of the lining membrane of the ventricles, and true dropsy of the ventricles. Of the first I think it may be said that it is very rare, though, as already mentioned, it is occasionally seen in posterior basic meningitis. Meigs and Pepper think otherwise, and state that in many cases the lining membrane of the ventricles is granular and much thickened. I have not found it so. They also state, in correspondence with this, that the fluid drawn off in these cases is frequently like the effusion in pleurisy or pericarditis; but here, again, except in one acute case, I have seen nothing in the ventricles in these cases but natural-looking cerebro-spinal fluid, even when I have found distinct evidence of bygone inflammation in adhesions about the base of the brain. Hillier states that dropsy may occur from obstructed veins, either from simple or pyæmic thrombosis. This would be a form of disease of similar origin to that of other cases—viz., obstructed venous circulation; therefore whether there is such a thing as spontaneous dropsy of the ventricles, apart from such a cause, must still be a matter of conjecture. Rickets is said by many to be a cause of hydrocephalus, but the evidence in proof of this derived from actual demonstration in the post-mortem room is very scanty. This discrepancy is, however, readily explained, and is not uninstructive. I am drawing my description from extreme cases such as no one would hesitate about—children with very large heads, and in whom the enlargement has existed for a long time. But if we are less exclusive in the ascription of hydrocephalus, then no doubt there are many cases, mostly in children of a younger age (under a year), in which the head enlarges, the veins becomes turgid, there are symptoms more or less of meningitis, and the ventricles contain a considerable excess of albuminous fluid, which is turbid, or flakey, or even purulent—cases which, because they are more acute in their onset, less lengthy in their duration, and some of them more amenable to treatment, I would remit to the domain of meningitis, and possibly sometimes even to that of congestion only. The subject is one of difficulty. It is quite certain that a good many case of posterior basic meningitis which have had some inflammation of the ependyma of the ventricles during the acute stage, subsequently become hydrocephalic and live some months in this condition. But there is no other evidence to show that the affection of the ependyma, represented in this late stage by thickening and opacity, is the cause of the hydrocephalus; indeed there is reason for believing that it is not; for the cause of the hydrocephalus is sufficiently obvious, if the brain be removed carefully, in the dense thickening of the arachnoid reflection between the medulla and cerebellum, and the matting of parts here which completely obliterates the foramina of Magendie and Luschka.

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* It is to this disease that I should ascribe the hydrocephalus which is occasionally seen in congenital syphilis. Dr. Dickinson, however, makes another suggestion—viz., that, like rickets, congenital syphilis leads to defective growth of the skull and inefficient support to the brain.

But it must be mentioned that most writers hold a different opinion, and Dr. Dickinson proposes a classification which has much to be said in its favour.*

He divides the subject into two: (1) Cases due to pressure of fluid within the cranium; (2) cases dependent upon diminished resistance of the walls without. In the first group come such as depend upon pressure on the intra-cranial sinuses and plexuses, and inflammation of the lining membrane. The second group is practically confined to rachitic softness of the skull, which in failing to give adequate support to the brain favours the effusion of an excess of cerebro-spinal fluid.

Of twenty cases, seventeen were in boys, only three were girls. Their ages: two of three months, two of six months, eight between six and twelve months, three of eighteen months, one two years, three four years, and one five years old.

Symptoms.—It is difficult to say much about the early onset of the symptoms. In some the enlargement dates from intra-uterine life; in one or two the complaint has come on suddenly after convulsions, or some acute illness; but fifteen out of the above twenty cases had a history of a gradual enlargement since the child was two or three months old. As to definite symptoms, there were generally none. Wasting was noticed in four; two had head pain—one so severely that I tapped the skull to relieve it, and with some success; two had crowing respiration, a symptom noticed by Dr. West; one, giddiness. The increase in size is very slow, and often oscillatory. In eleven cases measurements were taken from time to time. One had increased ¾ in. in three and a half months; another, 1 in. in two months; another, beginning at 17½ in., had gained ¾ in. in a month, lost ½ in. in three months, and then increased to 18⅜ in three and a half months; another remained stationary. There had been no fever in these cases.

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* "Lectures on Chronic Hydrocephalus," *Lancet*, 1870, vol. ii. pp. 73, 175.

As the disease progresses, and the intra-cranial pressure begins to tell, the child wastes; sometimes it has convulsions; ultimately it becomes blind, has nystagmus, and dies, gradually exhausted. Once or twice there has been some rigidity of the limbs; once retraction of the head. An examination of the eye in the later stages may show a swollen or inflamed disc, or a white and atrophied one. The latter has been more common in my experience. The cerebral symptoms vary much. The cases I have seen have seemed to me to present an average intelligence; sometimes an old-fashioned pseudo-precocity, such as Sir William Jenner pictures in rickets, unless the enlargement be extreme. In the latter case there has usually been blindness, intelligence has failed more or less completely, and the child has lain in bed taking notice of nothing. It feeds and sleeps; perhaps leading a painless existence; perhaps exhibiting some signs of distress on movement. It is not often that one has the opportunity of tracing cases on from the early stage of the disease to its completion. They are met with either early or late; if the former, then the symptoms are of equivocal meaning; in the late stage, the wasting, the pain, the blindness, and the enormous head—so large in many cases as to prevent the child taking any but the recumbent posture—cannot be mistaken.

Diagnosis.—The term "water on the brain," both to doctor and the public, occupies a very similar position in cerebral nosology to "consumption of the bowels" for abdominal diseases.

It is the refuge of the destitute, and has often been made to apply, not only to acute and chronic brain disease, but also to the convulsions of rickets or teething, the onset of an exanthem, or one of the many gastro-intestinal derangements which may be met with in profusion. The first point in the diagnosis is to eradicate from the mind the notion that a bulging fontanelle of necessity indicates excess of fluid in the ventricles. It much more often means merely a turgid brain. Some time ago I saw a child with Dr. Irwin Palmer, which had had constant convulsions for four days, an unusually bulging anterior fontanelle, a widely open posterior fontanelle, a retracted head, and a wearing cry. There were many points in favour of some acute meningitis with effusion. But another view seemed quite possible; dentition was proceeding; and the parents asserted that food brought on a fit; the diet was accordingly reduced, chloral and bromide of potassium given to quiet and thus lessen the loaded cerebral circulation, and the treatment was quite successful. I suppose that there can be no doubt that there was no meningitis and no effusion. We must look suspiciously upon all cases of supposed sudden effusion, and first determine whether there be not some temporary cause in the form of preceding or threatening convulsions for the swelling of the fontanelle. If the bulging be persistent, and the head slowly enlarges, if there be head pains, certainly not of rachitic origin, then we may begin to think of hydrocephalus. In making a diagnosis, the characteristic feature of hydrocephalus is a very gradual increase in the size of the head, without any pyrexia, and often without any evidence of ill-health. There may be a history of bygone meningitis, or something which denotes the present existence of some cerebral tumour. It is liable to be mistaken for rachitic enlargement of the skull, but this cannot be often. The rachitic skull is quite different. It wants the enlargement in all directions which is seen in the hydrocephalic skull, and thus the width and overhanging of the forehead, and the prominent and divergent eyeballs. The rachitic skull is long and laterally compressed, the forehead is high and square, and the bones may be thickened, soft, and tender. Moreover, there is the evidence of rickets elsewhere, and the evidence of tender bones in all parts. The two diseases may be, as I have already [illegible] me writers say often are—associated.

The disease may perhaps be confounded with hypertrophy of the brain, which is described a little later; but this condition is so rare and obscure, both in its symptoms and in the morbid changes which produce it, that no definite means of distinguishing it can be given.

Prognosis.—A case of advanced hydrocephalus lives, at best, a precarious life; but it is certainly instructive to notice how long the less serious cases do live, if we exclude those cases of hydrocephalus which supervene more or less quickly upon posterior basic meningitis. Children thus affected attend at hospitals for a year or two—at any rate, for several months, and then disappear from view; and it is my belief that many of the moderate cases hold their own, and, so to speak, get well. The pathology of hydrocephalus is a subject of great interest. Space has, unfortunately, prohibited my entering upon it; but putting aside such cases as are due to incurable conditions, such as pressure upon the veins by cerebral tumours, there is no reason, if hydrocephalus be due to the shutting off of the ventricles from the general sub-arachnoid space, why the ventricular cavities should not strike a balance in many cases, as is often seen in hydrocele, for instance, and the equilibrium of secretion be restored. Whether this be so or not we cannot tell, but this is certain, that hydrocephalic heads in considerable number are seen in the out-patient room at children's hospitals; the general health of these children, as a rule, is not bad; the evidences of cerebral trouble are few or none; the enlargement of the head is very slow, and often stationary; the majority are ultimately lost sight of, and only the few extreme cases are *known* to die. Even these linger on for a long time, perhaps fairly intelligent, most probably dull; but in the end intelligence and sight fail; and the child lives a vegetable existence. Death comes sometimes by convulsions; sometimes suddenly; sometimes, and this I think most commonly, by progressive emaciation, deepening stupor, failure of the respiratory centres, the accumulation of mucous in the tubes, and asphyxia; or else, by failure of deglutition, food enters the air-passages, and latent broncho-pneumonia develops. Of such of the less severe cases as are associated with rickets Dr. Dickinson speaks almost favourably "In those more numerous cases of chronic hydrocephalus," he writes, "in which the enlargement has not been heralded by convulsive vomiting, or any other sign of cerebral disturbance, in which we may infer that the fault is in the cranium rather than in the brain, we can generally relieve and sometimes cure."

Treatment.—Unfortunately one is not often in a position to be able to come to any conclusion as to what is the cause of the disease. All that is possible in many cases is to hope for the best, that there may have been some bygone local inflammation, the effects of which being tided over, an equilibrium of secretion, as I have ventured to call it, may be restored.

In all cases, therefore, it seems to me advisable to apply systematic support to the exterior of the skull as long as possible, and—in the hope, again, that something capable of absorption may be present—from time to time some mercurial ointment or oleate of mercury (five per cent. sol.) may be applied, or some iodide of potassium ointment rubbed in. This treatment has been recommended by Gölis, Trousseau, West, and others; and although it will often fail, it sometimes seems to do good. It must be carried out with care. A child's skin is a very delicate texture, and the pressure requires to be frequently varied and the surface rested, otherwise ugly sores may be made which hinder the treatment very seriously. The pressure is best effected, according to Dr. Dickinson's suggestion, by a band of elastic webbing, two to three inches wide, which is made into a fillet, and so adjusted as to compress the head just short of causing red marks, or of impressing the skin with the pattern of the texture of the material. The surface must be regularly and carefully cleansed, and bathed now and again with some spirit lotion. Internally, iodide of iron may be given, or cod-liver oil. Careful attention must also be paid to feeding if the child is wasting.

As regards tapping, it is not often successful, but there does not appear to be much risk attaching to it. Therefore, in advanced cases, if the skull is not too consolidated to allow of it, and the child be wasting and in any pain, it appears to be worth the trial. The parents must be prepared for the possibility of convulsions after; perhaps for a fatal result and for no very visible success in the way of relief.

A fine trocar and cannula are used, and passed into the lateral ventricle in the coronal suture at the outer angle of the anterior fontanelle, or at a distance sufficient to well clear the longitudinal sinus. The amount to be drawn off is usually limited by the amount that flows readily, which is often not much. The bones must be carefully supported during the flow of fluid; and, as soon as the tension inside the skull is insufficient to expel the fluid, the cannula should be withdrawn, and the head carefully strapped. In one case the fluid evacuated allowed the bones at the sagittal suture to overlap each other, and the head assumed a most peculiar appearance from the lateral compression that followed. Pressure was kept up by strapping, and the fluid never reaccumulated. The child was alive and in good health eighteen months afterwards. In a second case, in a younger child, with more acute symptoms, tapping was resorted to for the relief of the tension and the pain; only two ounces of fluid would flow, but the pain was certainly relieved. The child died a fortnight later, but such an issue had been expected, as there was in all probability some meningitis associated with it. In a third case tapping was resorted to, but very little fluid would flow, and the operation did neither good nor harm. I have seen three or four other cases treated thus in the practice of others, and in none has any harm resulted.

Recently an operation for the establishment of permanent artificial drainage of the ventricle has been tried. A tube is inserted with one end in the lateral ventricle, and the other in the subdural space, and the trephine hole is then closed by allowing the external wound to heal. The cerebro-spinal fluid is thus thought to be drained from the ventricles into the subdural space, whence it is absorbed. The results of this operation have been hardly more satisfactory than from the procedures already mentioned, but some successes have been reported.

External Hydrocephalus.—This term applies to fluid collected outside the brain, either in the arachnoid or some sac formed either in or in connection with one of the membranes. The origin of this condition is obscure. Most authors speak of it as due to hæmorrhage into the arachnoid, and subsequent changes in the clot. It and pachymeningitis interna, or blood cysts of the dura arachnoid, are not easily to be distinguished, and the latter are now generally believed to be of inflammatory origin. It is also occasionally associated with atrophy of the brain, the resulting space being filled by cerebro-spinal or serous fluid.

Of **symptoms**, this condition can hardly be said to have any that are well recognised as belonging to it; but, being a cortical affection, it might be expected to be more associated with convulsions and rigidity of the limbs on one side or the other.

The **diagnosis** will present great difficulties. It will depend much upon the irregular shape of the head, such as a local bulging in one part or another, or perhaps a condition of craniotabes. Perhaps it may be well to say that local enlargement of the head is a characteristic of some tumours, particularly of the posterior segment in cerebellar tumours.

Treatment.—This form often gives more hope of successful treatment. Tapping, and even repeated tapping, has already cured such cases; and it seems reasonable to hope that, with all the modern improvements in surgical procedure it, or other methods of drainage, might be carried out with a fair chance of a permanent cure.

CHAPTER XXXVII.

INTRA-CRANIAL TUMOURS.

Encephalic Tumours.—The brain substance may be occupied by a tumour of any kind, or of any localisation, but the large proportion of those which occur in childhood are of a tubercular nature, and are situated for some reason or other in the cerebellum, or, at any rate, below the level of the tentorium cerebelli. Of 37 cases of tumour in the brain in children examined *post-mortem* at the Children's Hospital, Great Ormond Street, 29 were tubercular, 6 were new growths, 2 were cysts. But the statement that tumour of the brain in children is most often tubercular requires some modification, for of the cases which present the *clinical* features of intra-cranial tumour probably only the minority are tubercular; out of the 37 cases mentioned above, only 11 showed evidence of intra-cranial tumour during life, and of these 11, 6 were cases of new growth, and 2 were cysts; so that only 3 out of 29 cases with caseous tubercular masses in the brain were clinically cases of intra-cranial tumour. That masses of tubercle should be a frequent cause of disease in the brain of childhood is only what might be expected, when we remember the remarkably lymphoid structure of the peri-vascular spaces in the brain, and the frequency of tubercular meningitis. It is less easy to say why the cerebellum, and perhaps the pons, should be so frequently attacked. Several reasons might be suggested, but inasmuch as no single one carries any conviction of its sufficiency, they need not be stated. The fact remains—tubercular tumours are very common in the cerebellum and the pons Varolii. Growths of other kinds also occur below the tentorium, and they are usually of gliomatous or sarcomatous nature. The central ganglia, the peduncles, and the cortex are attacked more rarely.

Symptoms.—It is well known that tumours of the cerebral substances, unless they are of large size or attack particular strands of its structure, give very indefinite signs of their existence. Should they be in the motor area of the cortex a monoplegia may result, or a localised weakness or convulsion in this or that group of muscles. But for the most part one has to be content with headache—mostly, I think, of paroxysmal kind—and vomiting. Tumours in the cerebellum or pons give symptoms which very seldom allow room for mistake. These are—intense occipital headache and vomiting, congestion, swelling, and neuritis of the optic nerves, followed by white atrophy and blindness, a reeling gait, tonic convulsions or rigidity, movements of the eyeballs, enlargement of the occipital segment of the head, and hydrocephalus or craniotabes. Some of these are symptoms we should naturally expect from a tumour, at any rate of any size, taking up its position in parts closely surrounded by such unyielding structures as confine the posterior fossa of the skull. We are familiar with the rending pain of an abscess pent up in fibrous structures, and it is more than likely that a tumour in the region in question acts similarly—it deranges the circulation, produces congestion, tension, and other abnormal relations in parts of a sensitive and vital activity, and the resulting distress is the natural outcome. Hydrocephalus is also easily explicable from the pressure upon the tentorium which must ensue, and the consequent liability to closure of the veins of the choroidal plexuses, or of the communications between the ventricular cavities and the sub-arachnoid space. The unsteadiness of gait is another well-known feature of cerebellar disease; rigidity, too, and movements of the eyeballs. These have all been proved to occur from experiments made by Ferrier with the object of determining the functions of the cerebellum, or those of its parts. Some of these symptoms are more constant than others, and of particular importance are the unsteady movements in walking and evidences of optic neuritis or congestion. These are rarely wanting, and the optic neuritis particularly may be an early symptom. Rigidity comes next. Perverted movements of the eyeballs are less constant; and enlargement of the head is often absent, and can hardly be expected where the bones of the head are ossified. In this case, however, slow thinning of the skull may take place, and cranio-tabes ultimately result.

Morbid Anatomy.—Solitary tubercle is the commonest form of tumour in the cerebellum, and its most favourite seat appears to be the hinder part of one or other lateral lobe; occasionally there is a smaller mass in the opposite lobe. But other tumours exist sometimes—gliomatous growths and either cystic tumours or simple cysts. The latter, although not common, may be kept well in memory. I must have seen some five or six cases, and one can never see a fatal ending in such as these without regretting that surgery was not allowed to attempt a cure.

Diagnosis.—The symptoms of cerebellar tumour admit, in general, of little mistake; but it must, of course, be understood that tumours in this part are liable to implicate by continuity those that are its neighbours, and thus produce other symptoms. Tumours in the pons Varolii, or growing from the tentorium, might compress or spread to the cerebellum, and thus produce the symptoms of a tumour of the latter.

A tumour, if located in the pons, may produce nothing but general tremor of the acting muscles. More often there is some paresis of the extremities on one or both sides; sometimes paralysis of the third or sixth nerves, and so on. Gliomata in the pons, moreover, have a tendency to enlarge the pons uniformly, so that, on section, the disease looks more hypertrophic than of foreign material, but when they reach the surface, they may become sub-lobulated and implicate the trunks of the neighbouring nerves. We have seen several gliomatous enlargements, of one of which a short note follows:—A boy of nine years was stated to have been quite well one month before his admission. He then began to fall about, complained of inability to swallow his food, and once or twice almost choked. He was admitted with right facial paralysis, and paralysis of the right side of the tongue, and a staggering gait. His optic discs were normal (this seems to be a point in the case which might prove of diagnostic importance in similar cases). After a short stay in hospital, he gradually lost power in his left arm and then in his left leg, and lastly he became rigid on both sides. He died in a semi-comatose state. At the post-mortem, the entire pons and medulla were swollen by what appeared to be a general hypertrophic enlargement, so that it was impossible to say, from the naked-eye examination, where the disease began or ended.

The surface of the tumour was very peculiar from the number of small lobules over it, and which gave it somewhat the appearance of the wattles of a fowl. Dr. Wilks recorded one of the earliest specimens of the kind in the *Transactions of the Pathological Society* in 1856, vol. vii. p. 26. Dr. Angel Money has described two similar cases,* and gives a typical representation of one; Dr. Gee and Dr. Percy Kidd have each recorded another, and it is probable that others have gone unrecorded rather than that they are very rare. Gliomata are slowly growing tumours; they infiltrate the part, so that it is impossible to state precisely the boundaries of the growth. Between tumours of the pons and cerebellar tumours it will sometimes be difficult to decide. The existence of muscular feebleness, or general paralysis, or local paralysis of the nerves, will be in favour of the affection being located in the pons; and it may probably be said that, given a lesion limited to one of these two positions, the muscular irregularity is more of a general tremor when the lesion is in the pons—a more irregular and jerky form of ataxia when the cerebellum is affected. Rigidity may, it would seem, go with either.

The position of tumours elsewhere must, of course, be assigned upon similar grounds—viz., by the perverted or banished functions of the part in which they are situated, over and above the fundamental disturbances of headache and vomiting. For instance, if the growth be in the cortex there may be some local paresis of muscular movement; some erratic muscular action, either spasm or convulsion: some defect of sensation; of sight; of other special sense; of moral sense, or intelligence.

Prognosis.—This resolves itself in most cases into a question of how long. If we can, by the general aspect of the case, exclude a mass of yellow tubercle, then glioma, being the next most probable condition, is liable to go on a long time, but the ultimate result is no less sure. Tubercular masses also are sometimes of very slow growth, and sometimes become quiescent for a time, sometimes even for years, but in most cases they ultimately cause death, either as tumours, or by the extension from their margins of a tubercular meningitis.

Treatment.—With perhaps an exception to be mentioned directly in the case of simple cysts, the treatment resolves itself into the relief of pain and careful nursing. For the relief of pain, iodide and bromide of potassium, chloral hydrate, or opium must be given; and in one case, these means being insufficient, and the pain apparently terrible, I considered myself justified in resorting to trephining. It was in a child of three years, with evident indications of a cerebellar tumour. Mr. Jacobson trephined the skull in the left half of the posterior fossa, as low down as possible, so as to avoid the lateral sinus; and in the bare hope that the tumour might be cystic, a fine trocar was passed into the cerebellum, but without any result. The trephine wound was made as large as possible, with the idea of relieving the tension below the tentorium, and for a time the screaming fits were somewhat relieved. The part healed very rapidly, and deep down in the neck a firm membranous covering closed in the aperture, but the relief gained was not for long. The case ultimately proved to be tubercular. Nevertheless, this treatment seems to be worthy of consideration, not only for the relief of pain, but in other cases for another reason—viz., the tendency that exists in the cerebellum for the formation of simple cysts. There is no means of arriving at a diagnosis without the trephine, and it seems to be quite worth the while, in a disease which is hopeless without it, to give the patient just the faint chance trephining offers of coming upon a cyst and evacuating its contents. Modern antiseptic surgery has taken away much of the danger that attached to trephining in former times, and there is no extraordinary risk in the operation nor in puncturing the membranes and lateral lobes of the cerebellum with a fine trocar.

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* *Med.-Chir. Trans.*, vol. lxvi.

In another case trephining has for the time relieved all the symptoms of a cerebral tumour, and recently Mr. Burghard, at King's College Hospital, removed a large tumour from the right lobe of the cerebellum in a boy of twelve years, who, when last seen eighteen months after the operation, was in good health and had lost his optic neuritis and all the other symptoms (*King's Coll. Hosp. Rep.* vii. p. 255).

CHAPTER XXXVIII.

HYPERTROPHY OF THE BRAIN—CEREBRAL HÆMORRHAGE — THROMBOSIS OF THE CEREBRAL SINUSES.

Hypertrophy and Sclerosis of the Brain are usually mentioned by writers on diseases of children, but it may be noted that the literature of the subject increases very slowly, and that writers allude to their own personal knowledge of it in a somewhat vague manner. The only recent addition to our knowledge appears to be that, whereas in former times the nature of the disease was unknown, of late years the condition has been definitely described as due to an increase of the neuroglia of the brain—to the disease therefore which is now called sclerosis. I see no reason why both diffused and disseminated sclerosis should not sometimes occur. I have said elsewhere that children occasionally come under notice with symptoms very closely resembling those of disseminated sclerosis in the adult. But the actual demonstration of the condition by post-mortem evidence is scanty in the extreme, and I do not know that as yet it can be said to have been shown to have occurred. In reading over the cases of hypertrophy of the brain recorded, one cannot but be struck with its close association with a rachitic skeleton; and inasmuch as a thick skull is found in rickets, one is doubtful in some cases, in the absence of actual weights, how far the large head was due to actual increase of brain matter, how far to the size of the skull. Dr. Gee has recorded two cases,* however, in which the brain was very heavy. A boy aged 2¾, highly rickety, and suffering from convulsions; the body weighed 17¾ lbs., the brain 59 oz.; the average at this age being 38.71 oz. A girl of the same age, and also rickety, weighed 15½ lbs., and the brain 42½ oz., the average being 34.97 oz. In both cases the brain appeared to be perfectly healthy. Dr. Hilton Fagge alludes to one case that came under his own notice, and to six others under Dr. Fletcher Beach, of the Darenth Asylum. Dr. Beach has found a uniform granular appearance in the white matter under the microscope, with nerve-cells scattered sparsely throughout, and an infiltration of the tissue with leucocytes. The increase in size was evidently due to the large amount of granular matter.* I should myself be disposed, while calling attention to its occasional existence and to the necessity of closely investigating all curious brain symptoms that occur in cases of rickets or elsewhere, to emphasise the remark of Dr. West, made long ago, but still true: "I am not sure that an undue importance has not sometimes been attached to it, as though it were of much more common occurrence than you will find it to be in practice." I have not hitherto met with such a case.

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* "On Convulsions in Children," *St. Barth. Hosp. Reports*, vol. iii. p. 109.

It is said to come on slowly at an early age, and to be attended with loss of health, dulness, apathy, and a liability to convulsions; the head seems too heavy for the child, and it frequently bores in the pillow. In older children the gait may be feeble or tottering. The disease may run a course of years: one of Dr. Beach's patients was sixteen. It ends by some intercurrent pulmonary affection, by gradual exhaustion, &c.

Cerebral Hæmorrhage is a rare condition in children, but it is nevertheless an important one. It may be meningeal or intra-arachnoid (the two cannot be separated), or into the substance of the brain. The former is most probably more common than it has been proved to be upon the post-mortem table, for the reason that in many cases there can be no obstacle to recovery, and looking to the many possible causes of such a condition in early life, it is very likely indeed that some, if not many, of the chronic thickenings, cysts, and other affections of the membranes, which are denominated inflammatory, may have their origin in surface hæmorrhage. It cannot, however, be said that this is certainly so, except in a few instances.

Meningeal Hæmorrhage may be of all degrees of severity, from mere capillary ecchymosis to a diffused layer of clot of some standing. It appears to be more common in new-born children, the reason for this, no doubt, being the disadvantageous conditions of the circulation which occur during delivery, whether natural or instrumental, and the circulatory changes that take place within a short time of birth. Of other conditions, whooping-cough and severe purpura will at once occur to any one as liable to lead to it, and cases are on record due to each of these diseases. Thrombosis of the sinuses, the various abnormal blood conditions met with in the exanthemata and other fevers, are also noticed as being occasional causes.

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* "The Principles and Practice of Medicine." By the late Charles Hilton Fagge. Fourth edition by P. H. Pye-Smith, M.D. Vol. i. p. 850.

Symptoms.—It cannot be said to have any which are pathognomonic, but in any case in which its existence is rendered probable, a sudden coma or collapse, a weakness of the limbs on one side or the other, perhaps a convulsion also, might lead to a guess that something of the kind had happened.

In the cases which occur at birth, the condition may be fatal at once, so that the child is still-born, or it may drag out a feeble existence of a few days with convulsions or rigidity. If the child survives, there is likely to be some degree of spasm of one or more limbs, and the intellect is often impaired, the condition of the child in fact is the same as that seen in the case of spastic paralysis which has developed after birth. These cases of meningeal hæmorrhage form, no doubt, a part of the group known as "birth-palsies."

Prognosis.—It might fairly be hoped that by quietude and careful feeding absorption of the clot would take place and recovery ensue. But for such a case it may be well to say that, although the prognosis might be favourable, there is abundant evidence in adult life to show that meningeal extravasations are slow in disappearing completely—pigment and thin layers of lymph are found many months after extravasations of this kind. Consequently, the greatest care is necessary to preserve the patient from excitement or active brain-work for a considerable time after such an occurrence.

Hæmorrhage into the substance of the brain is rare in children. When it does occur it is usually secondary to ulcerative endocarditis, and is due to embolism; the hæmorrhage is liable to be preceded by the formation of a small aneurism. In very rare cases it has been due to atheroma of the vessels in childhood.

Symptoms.—These are the same as in apoplexy in the adult—viz., sudden onset of hemiplegia with more or less coma, or some general paralysis if the plug happens to block the basilar artery, instead of the more usual seat of left or right internal carotid at the base of the brain.

The **diagnosis** depends mostly upon the evidence of the existence of heart disease, or of some reason for the formation of clots, on the valves or in the cavities—either from recent rheumatism, or chorea for the valves, or from scarlatina, or typhoid, or other exhausting illness for dilatation of the left ventricle. It must always be difficult to say whether the embolism remains as such, and the paralysis is embolic only; or whether an apoplexy has followed it.

Prognosis is grave in all cases due to valvular disease, because the embolism most commonly occurs, or, at any rate, produces such severe symptoms, in the worst cases only. The valvular disease is likely to be of ulcerative form and of infective nature; the patient to be febrile, anæmic, and very likely with albuminuria. Hæmorrhage following upon embolism denotes extensive softening, and, in the rare cases due to atheroma, the disease has been usually basilar and the hæmorrhage into the pons or its neighbourhood. Supposing that hæmorrhage could be excluded, and the case diagnosed to be one of embolism only, probably a slight distinction might be made in favour of clots discharged from a dilated ventricle. I think that these, not having an inflammatory origin, are less likely to provoke a local inflammation in the vessels in which they lodge than are those which are discharged from an inflammatory focus on the valves.

Treatment.—Absolute rest; ice or cold lotions to the head; the bowels should be kept active, and food administered carefully. Here, too, as in adults, the lungs should be watched and preserved from the accumulation of mucus at their bases, by attending to the position of the child, which should be frequently changed from side to side.

In the more common cases of apoplexy, due to valvular disease, one- or two-grain doses of quinine should be given if there be any pyrexia, and the heart's action should be quieted and sustained by opium, bromide of potassium, belladonna, or digitalis.

Thrombosis of the Cerebral Sinuses.—In the larger number of cases the lateral sinuses only, one or both, are affected, the longitudinal sinus also, but rarely. In these cases the disease is due to disease of bone, and in infancy chiefly to disease of the ear, the inflammation of the petrous portion of the temporal bone causing phlebitis of the petrosal or lateral sinus. But there are also many other cases, most of them children under two years of age, in which no such cause can be found. In these it has been noticed that the clot is less in the lateral than in the longitudinal sinus.

Virchow originally pointed out that not only in the cranium but in the pelvic veins and the veins of the lower extremity, the blood runs at times so slowly as to render spontaneous coagulation a risk, and in the longitudinal sinus of the cranium the shape of the channel, and the fact that the tributary veins run into it in a direction against the stream, have always been considered to favour thrombosis. Thus when no cause has been found for the coagulation, as has often happened, it has been assumed that the coagula are due to these natural conditions telling disadvantageously upon an unnaturally feeble current.

A very good division, therefore, of the cases of thrombosis of the cerebral sinuses is that given by Steiner, into exhaustive and inflammatory. The exhaustive essentially concern the longitudinal sinus, and are found in any feeble, depressed conditions, such as cholera infantum, scrofula, rickets, &c., and they form some of the group which has received the name of "spurious hydrocephalus." The inflammatory form affects chiefly the basal sinuses, and can be traced to disease of the ear, and injuries or local inflammation of the cerebral membranes.

The **symptoms** are very obscure in the exhaustive cases, and the thrombosis is found unexpectedly at the autopsy. Lethargy, stupor, or coma are the more common; convulsions occur in some cases, and we have seen paralysis where softening of brain substance was associated, as it occasionally is, with the thrombosis; epistaxis occasionally results from plugging of the longitudinal sinus. Any obstruction in the cavernous sinus—which, however, is very rare—might be detected by the morbid appearance of venous congestion visible by the ophthalmoscope at the fundus oculi.

In the inflammatory cases, particularly those due to ear disease, there are often severe symptoms associated with thrombosis of sinuses. The child has repeated rigors, the temperature is very irregular and often very high, and in addition to the tenderness over the diseased bone, there may be tenderness along the internal jugular in the neck.

The symptoms may closely simulate those of meningitis, and indeed in some cases are due to secondary meningitis. Optic neuritis is also sometimes present.

Treatment.—The exhaustive form is one for prevention rather than cure. The risk is to be remembered in feeble infants, and wine and good food administered. So also is the inflammatory form one for prevention, seeing that it arises so often from disease of the temporal bone, and that this follows upon discharge from the ear. Much may be done by paying careful attention to cleanliness and the application of antiseptic collyria in cases of this kind, and—should any evidence of disease of the bone unfortunately arise—timely surgical interference by an incision over the mastoid and drilling or trephining may possibly give an outlet for fœtid material and thus avert a fatal result.

CHAPTER XXXIX.

DISORDERS OF MOVEMENT—INFANTILE PARALYSIS.

Infantile Paralysis.—The alpha and omega of the student's knowledge on this subject comprises often no more than a few facts about what has from time immemorial received the name of "infantile paralysis." But there are at least several other forms of paralysis which, if not quite so disproportionately infantile, are nevertheless common in childhood, and deserve to be reckoned among the diseases of children. And others, again, though occurring more often in adults than in children, must be enumerated as occasional occurrences, lest being unexpected their import may be mistaken. I shall not attempt any scientific classification of these, because our knowledge of their causes, or rather of the lesions by which they are produced, is still very meagre. Some are due to cerebral, others to spinal lesions; some, probably, to no lesion at all. I shall take them as they most frequently come under the notice of the student.

Infantile Palsy, as the most familiar form of the disease, may be taken as a starting-point. "Essential paralysis" it is sometimes called, because at one time it was supposed to be due to a disease of the muscle. Some still contend that a muscular lesion is the primary fault, and that the nerves or cord undergo subsequent changes from an ascending neuritis; and to this opinion, and to its probable applicability to some cases, I shall have to return presently. But the generally received doctrine is that the paralysis is due to a primary disease of the nerve-cells of the anterior cornua of the spinal cord. It is a disease which is not confined to infancy, but so largely preponderates then that 154 cases, out of a total of 205, occurred between the ages of six months and two years. It has been noticed within a few days after birth (Ross). It is liable to affect the healthiest children, attacking either sex equally, and is said to be more common in the summer months. It sometimes follows immediately after specific fevers. We have several times seen it occur during convalescence from scarlet fever; it has been seen also after measles and influenza. I have sometimes thought that a rheumatic parentage might have something to do with its production, but nothing is certain as regards this. Duchenne states that he has not been able to associate it with nervous disease in the family of any kind. Of exciting causes, exposure to cold is often mentioned, and of this the following is a striking instance:

A male child of five months old was sent to me by Mr. Richardson, of Croydon, with this history. Its father had suffered badly from rheumatic fever. The child was taken out in October, when six weeks old, and kept out on a cold day for two and a half hours, late in the afternoon. It was brought home "perished" with cold, and with its eyes drawn up and snatching its breath. It was in a burning heat all night, and kept starting as if falling. It was unconscious for a week or more, and was continually moaning. It gradually recovered from the coma, and at the end of a fortnight its right arm was found to be quite useless. This had recovered somewhat since, but was still so in great measure.

Symptoms.—These will be best illustrated by a case. The one already given is a typical one, but another may be added:

A boy ten months old went to bed quite well one night, and when taken up the next morning was "paralysed all over"—that is to say, his head dropped about, and he had no power of sitting or moving—the trunk muscles being paralysed. He was also feverish, but no teeth were being cut at that time. The leg was noticed to waste afterwards, and use in it was never regained, although the general paralysis improved. The child was brought to the hospital two months after the attack. His right leg was mottled from cold; it hung flaccid from the pelvis, and was perfectly powerless. On passive movement, it could be put into almost any position, the hip being unnaturally lax, without any pain. In all other respects the boy seemed quite healthy. Dentition had progressed rapidly, and he was not rickety. The muscles failed to respond to the Faradic current, but reacted slightly to galvanism.

Such is the short and usual history of infantile paralysis. A healthy child sits in a draught, gets cold, cuts a tooth—anything possibly, nothing certainly—and becomes feverish, fretful, is perhaps convulsed, or semi-comatose, and is shortly found to have *general* paralysis. The child often cries when it is moved about, or when its limbs are touched; but it is doubtful whether this is due to pain or merely to the disturbance when it is not feeling well. In a day or two the fever passes off, and with it, perhaps, some of the paralysis; leaving a leg or an arm, or both legs, or perhaps one side, or perhaps only this or that group of muscles, completely paralysed. If the child is taken to the doctor he recognises at once the dangled limb, and finds more or less complete absence of response to the Faradic current; more or less qualified action with the galvanic current, but no alteration of sensation. This, however, is hardly a common hospital experience. Three or four months usually elapse before medical aid is sought. By that time the limb is much wasted; the skin is often livid from the sluggish circulation consequent upon the reduction of temperature; all the soft parts are flabby, and the electric irritability to any form of current is quite destroyed. Perhaps years elapse, and then, in addition, there is dwarfing of the affected limb from diminished growth, and sometimes deformity from the unbalanced action of those groups of muscles which are not paralysed. Deformity is perhaps less common in infantile than in other forms of paralysis, excepting, perhaps, that of talipes equinus and varus, because it so frequently happens that the entire limb is affected.

The characteristic features of the disease, then, are: the initial fever, the sudden onset of motor paralysis, the rapid loss of electric contractility in all those muscles which are severely affected, followed by their progressive atrophy, and the gradual restoration subsequently of all those muscles in which the electric contractility is preserved at the end of the first fortnight. There is no progressive character about the disease—the mischief appears to be worked at once and then ceases. The affected muscles atrophy, but no fresh ones are attacked; and, while perfect recovery is perhaps seldom seen, a partial recovery is the rule.

All reflex actions are lost in the affected muscles, to be regained, however, as the muscles recover themselves. Sensation is unaffected usually, but it is not uncommon to find considerable tenderness, apparently in the muscles, of the affected limbs, during the first few days after the onset; tactile sensation is also sometimes dulled during this early stage.

It is usually stated that the bladder and rectum are never affected, and this is undoubtedly true as a general rule, but in a few cases during the acute stage there is either difficulty of micturition or incontinence of urine which disappears as the acute symptoms subside.

As regards the fever at the onset, Duchenne states it to be usually, but not invariably, present; of seventy cases it was absent in seven. But no negative statement of this kind is of great value when such young subjects are concerned—moderate fever is so often unappreciable except to the thermometer.

The seat of the paralysis is very variable. The following table is from Duchenne's "L'Electrisation Localisée," as given by Dr. Poore.

In sixty-two cases there were:

5 of general paralysis.
9 of paraplegia.
1 of hemiplegia.
2 of crossed paralysis.
25 of paralysis of right leg.
7 of paralysis of left leg.
10 of paralysis of right or left arm.
2 lateral paralyses of the upper limb.
1 paralysis of trunk and abdomen.

In my own cases the right leg was paralysed in six; the left and left arm once each; the right arm twice; the distribution was hemiplegic once, general twice; in both legs three times; in five out of sixteen cases the pain at onset appears to have been pronounced.

Paralysis of cranial nerves is very rare in infantile paralysis, but it has been recorded several times. We have seen well-marked facial paralysis in a child with very severe general illness and semi-coma at the onset of the disease. The facial palsy disappeared completely as the acute stage subsided, only one leg remaining permanently paralysed.

Morbid Anatomy and Pathology.—This form of paralysis has been supposed to be due now to muscular disease, now to disease of the nerve-endings in the muscles, or to disease of the efferent trunks. But all the examinations of recent years have gone to show that there is an actual disease, inflammation, it is called, of the spinal cord. The affected muscles undergo rapid fatty degeneration, but only in consequence of irreparable destruction of the motor areas in the cord. The changes which occur are as follows: In the earlier stages small foci of softening are found in the grey matter of the anterior cornua. They are usually of small size, run in vertical streaks, and are particularly liable to attack the cervical and lumbar enlargements. They may be of reddish colour, and in some cases have been found to be associated with minute hæmorrhages, and with thrombosis of small vessels. Under the microscope these foci show an increase of the capillary network, and œdema of the vessel walls, with a nuclear growth in more or less profusion. In the later stages, as might be imagined from what is known of the laws of pathological changes, the appearances are those of the so-called sclerosis—that is to say, the connective tissue between the nerve-fibres undergoes increase and thickening, and the nerve-cells and nerve fibres become atrophied. The common appearances in old cases of infantile paralysis are diminution in size of the affected part of the cord—diminution of the one anterior-horn of grey matter as compared with the other, and shrivelling and over-pigmentation of the nerve-cells. Sometimes the corpora amylacea of nerve degeneration are found also. The nerve-trunks related to the affected limb are smaller than those on the other side, and the muscles are atrophied and, in many cases, replaced almost entirely by fat.

Finally, it is worth remark that the bones of the affected extremities are stunted, and that not in proportion to the extent of the paralysis—*i.e.*, to the want of movement. Very slight paralysis may be attended with much shortening, and in extreme paralysis the affected limb may be no shorter than its fellow.

The disease which produces all this mischief in the cord is an acute anterior polio-myelitis, or an acute inflammation of the motor-cells; and this opinion is based upon most of the hitherto recorded microscopical examinations of the spinal cord. Some have discussed whether the change is in the nerve-cells or in the interstitial matter surrounding them, but this is a matter upon which we have no evidence, and which is not of importance. In one or two cases the appearances have been those of a small extravasation of blood in the cord rather than of an inflammatory condition.

Whether the disease is in all cases limited to the cord may be doubted. Such cases as the one we have mentioned above, where one at least of the cranial nerves was affected and where semi-coma was present, give some probability to the suggestion that the brain also may be affected; there may be, in fact, a polio-encephalitis as well as a polio-myelitis. It is certain, at any rate, that the spinal cord may be affected as high as the cervical region; in one case that came under our notice the diaphragm was affected together with the upper limbs. There seems, therefore, to be no *a priori* reason why the disease should not affect the parts higher up still, and it may be, as Dr. Buzzard has suggested, that some of the rare cases of sudden death in childhood are due to infantile paralysis affecting the medulla and paralysing the vital centres.

Recently Dr. F. E. Batten* has brought forward the evidence of microscopic examination in two cases to show that both in the cerebral cortex and in the nuclei of the cranial nerves vascular lesions consisting of congestion with minute hæmorrhages and thrombosis of small vessels are sometimes found, lesions which differ in no way from those found in the grey matter of the spinal cord in infantile paralysis.

It must be remembered that the cases examined are by no means many, and the majority of these have been procured many months, or many years, after the lesion has occurred. Only in very few has the disease been so recent as two months after the onset of the paralysis. In saying this we do not wish to call in question the facts recorded, but only to impress more strongly that we are as yet quite in ignorance of the *essential* cause of the disease. Even allowing the morbid anatomy to be as we have stated, we yet require to know what leads to the disease in the spinal cord; it is still to clinical data that we have to appeal in great measure to support any view of its nature.

Now these data are of two kinds, and seem to point in different directions.

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* *Lancet*, Dec. 20. 1902.

1st. One class of cases is attended with fever, often high, and the paralysis is at its first onset a *general* paralysis, and I believe often associated with pain. This class furnishes a conclusive proof of a central nervous affection, for a general paralysis can hardly be anything else. It is impossible to suppose any sudden general affection of the muscles or of the peripheral endings of the nerves. It would seem not so very improbable that this initial fever might be the essential disease, and the nervous affection the result of it. Acute febrile conditions are dangerous to the vitality of all tissues, but most of all to the nervous system of a rapidly developing infant. All acute febrile disturbance in infancy is liable to be ushered in by a convulsion, or, still more commonly, by a rigid spasm of arms and legs, fingers, and toes, more or less closely resembling the contraction of "tetany." This is a not infrequent history of the onset of a case of infantile paralysis, and there is no great improbability in the hypothesis that to some acute febrile disturbance the paralysis is due. But it may, perhaps, be deemed curious that the febrile state should spend its force exclusively on the nerve-cells of the anterior cornua, and be, indeed, but partially distributed amongst them. To such an objection it might in part be replied, that the nervous affections of childhood are largely motor disturbances. Children do not complain of pains and aches with anything like the frequency that adults do. Convulsion, spasm, chorea, &c., replace pain in great measure, and one would therefore suppose that, given a cause, acting equally on all parts, those most used and sensitive would best show the results of the working of the cause; and in childhood, therefore, the motor-cells would be likely to fail first. But it is unnecessary to adopt this line of argument, because a better is at hand, viz., that the pyrexia does not act solely on the anterior cornua, it acts upon the entire cord, often upon the brain and cord, and thus we have at the onset coma or a general paralysis and some pain. If this be the case, the only peculiarity that needs explanation is the partial distribution of the disease, as evidenced by the subsequent symptoms and also by the morbid anatomy. But this is quite explicable by what we know of the physiology of the cord. In the first place, the cause of the affection being a very transitorily acting one, much of the original paralysis generally clears up, and thus in the end only a small lesion in the cord is discoverable. Then the paths of sensory impressions do not seem to be so strictly localised, as the motor. How far more common it is to find motor paralysis at any time of life, than it and anæsthesia combined; there may be a complete loss of motion from even diffused changes in the cord, and yet no anæsthesia, a fact that can only be explained by assuming, what has indeed been proved by experiment, that the sensory currents filter through the cord rather than run in streams. Minute lesions in such a case would naturally be more difficult to detect when we have no immediate opportunity of examining the diseased structures, and are, indeed, mostly unable to do so until many months or years after the original affection.

Some hypothesis of this sort takes away the chief difficulty in understanding the disease, or, at any rate, a difficulty which is a stumbling-block to many, viz., the impossibility of giving any satisfactory suggestion why, as it were without rhyme or reason, a few motor-cells should seem to be picked out here or there, while the rest of the cord goes scot free. It is probable that what seems so apparent is, nevertheless, not the real state of the case, but that there is a general acute disturbance of the nutrition of the entire cord, which rapidly subsides as its cause, pyrexia, subsides, leaving here and there some parts shattered by the storm. The regions most conspicuously affected will naturally be those in which the motor nerve-cells largely congregate, for not only is the motor lesion concentrated while the sensory is not, but the motor function that is destroyed corresponds with an absolute loss of nerve-centre, and this entails other secondary consequences of trophic and atrophic character, which must add to the primary lesion. As a rare occurrence some evidence of mental weakness occasionally remains, more especially in such cases as at the onset have shown extreme cerebral disturbance; it sometimes happens that in the generalised paralysis we have already described the child is delirious or even unconscious, and may remain so for several weeks. This group of cases confirms, then, I think, from clinical data, the opinion derived from pathological observation, that the centre is at fault.

There is some reason to suppose, as regards its essential cause, that in infantile paralysis we really have to do with a specific disease, due to some virus which has a special affinity for the spinal cord. The possibility of such a selective action of a virus is sufficiently proved by the discoveries with regard to tetanus; and, moreover, it has been shown quite recently that there are grounds for believing that certain forms of acute myelitis are associated with the presence of micro-organisms in the substance of the spinal cord. It is extremely difficult to obtain any evidence with regard to the acute stage of infantile paralysis; but such a possibility is to be borne in mind, and there are certain clinical facts which seem to favour such a view. Cases have been recorded, although they are certainly far from common, where more children than one in a family have been attacked by infantile paralysis at the same time. We have ourselves seen one case where the disease appeared to have attacked two children in one house within three weeks; and Dr. Pasteur has recorded its occurrence in three members of one family within a short time. Moreover, epidemics affecting a large number of children have been recorded at Stockholm and elsewhere.

One of recent date is that recorded by Caverly,* near Rutland, Vermont, in the United States, where 119 cases occurred in the summer of 1894; and still more recently H. Dwight Chapin† has recorded an epidemic at Poughkeepsie in America, during July and August 1899. He points out that, whilst some of the cases presented the ordinary features of acute anterior poliomyelitis—one indeed was verified by post-mortem examination—others by the association of much pain with the paralysis, and their subsequent complete recovery, suggested rather neuritis.

Before parting with the subject, the student may be reminded that, although we call this disease *infantile* paralysis, yet there is an exact counterpart of it in adults, called "acute atrophic spinal paralysis," a rare disease, but one which is sometimes seen in the form of general paralysis of sudden onset and sudden recovery, for the most part, leaving only groups of muscles paralysed here and there.

2nd. There is, however, another group of cases, in which the evidence of a central primary affection, although such is assumed to be existent, does not appear to be by any means so conclusive.

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* *New York Med. Record*, 1894, vol. ii.

† *Trans. Amer. Pædiatric Soc.*, 1900, p. 158.

There is no evidence of any general paralysis; none, perhaps, of pain. All that can be told of the case is that a loss of power in this limb or that has been noticed quite suddenly. It often happens that we are told that the child was left playing on the floor for some time, and when taken up was found to be affected, or that it went to bed well and woke up paralysed. This is, no doubt, the history which is obtained at first in many undoubted cases of anterior polio-myelitis, and to that affection all these cases are now uniformly ascribed. Nevertheless, some of them bear so much resemblance to some cases of facial palsy, as seen in adults, that the question of local and not central origin may, at any rate occasionally, be entertained. There is no class of nerve cases more uniformly associated with a definite onset than Bell's palsy, as it is called—paralysis of the portio dura on either side—and its history is this: The patient, a little below par, perhaps, is exposed to wet or cold; very frequently it can be stated that, at a definite time, he sat in a draught, with a stream of cool air playing on to his cheek. The history is so constantly one of this kind that it seems to be impossible to associate the symptoms with any central lesion, hardly possible to believe otherwise than that some local change must have been wrought in the nerve, as it lies in its somewhat exposed situation on the side of the face or crossing the roof of the tympanum. And what are the symptoms? They are emphatically sudden onset, rapid loss of Faradic contractility, and more or less complete recovery in the space of a few weeks, or less. And if it be true that such a cause can produce such a result in adults, there is no improbability in supposing the existence of some similar affection in children. It is curiously seldom that facial paralysis is found in childhood, except under other circumstances presently to be mentioned (p. 562). But in this, perhaps, we may see in part an illustration of the rule, that those regions most subject to use or strain are most liable to break down; in part, perhaps, it is explained by the relative degree of liability to exposure and injury which various parts suffer at different periods of existence. The limbs in children are all movement, uncontrolled movement, and exposed in many cases constantly; as yet the facial nerve, though no doubt exposed now as it is later on, has not become subject to the constant strain involved in the ever-varying phases of expression. Thus, I think, is explained the fact, that children are liable to suffer from local paralysis of limb rather than of face; and it seems possible that, even though the nerves involved be mixed ones, yet the sensory function, suffering less, might be difficult of detection at this age, and the entire trouble thus pass for motor.

I am, therefore, quite prepared to think with Dr. Buzzard, that the hypothesis of a peripheral neuritis better accords with the clinical history of some cases of infantile paralysis than does that of a central lesion. But Dr. Buzzard goes beyond this; he writes: "It is highly probable that a certain number of cases of so-called infantile paralysis are examples of multiple neuritis. I am much disposed to think that in the cases of infantile paralysis which make unexpectedly good recoveries after very long delay the lesion may have been in the nerve trunks, and not in the anterior ganglia of the cord."

I know not how this may be, but assuredly the cases in question are wanting as yet any adequate solution of the dilemma with which they present us. They are not common, but the following is a striking case:

Gertrude S., three and a half years, was admitted into the Evelina Hospital in December 1883, for a general paralysis, which had existed for six months or more. It had come on after no definite illness, and the first thing noticed was that she frequently stumbled, and fell, and next, that in feeding herself she would use one hand to support the other. Latterly she had been unable to use her hands at all, and when not fed by any one she would bend her head down to her plate. Two months before her admission she had been taken to the seaside, but returned in a state of complete helplessness.

When admitted she was unable to stand or move her extremities. When placed in a sitting posture she would perhaps remain so, but had a tendency to roll over to her right side. She was unable to move either legs or arms, and the movements of the chest were extremely shallow. The muscles of her extremities were flabby and wasted, and gave no response either to Faradic or galvanic current. Notwithstanding, she was assiduously galvanised, but without any very obvious result for many months, during which time she took and recovered from measles, although for many weeks after this there was extensive consolidation of the bases of both lungs, due, as I supposed, to the existence of atelectasis from the combined influence of the catarrh, of the measles, and the impaired movements of the chest. She was in the hospital altogether eleven months, and during the latter part of her stay she decidedly improved. The improvement first showed itself by her being able, with some effort of her shoulder muscles, to throw her forearms across her chest; and then in the regained power of clumsily moving her thumb and fingers, and latterly she could feed herself, and was just able to crawl round her cot by holding on to the rails. But the progress was so slow that I was not very sanguine of her future when she left. She was brought to me for some other ailment six months later, and by this time she was comparatively well. She had gradually improved; three months after leaving the hospital she had begun to walk about, and she could now walk and run about fairly well, though treading on the sides of her feet, and thus wearing the heels of her shoes into a keel. The muscles of the palms of the hands were still very flabby, and the flexors of her fingers moved badly. Her movements are now described by her mother as natural.

The deformities that ensue will depend in great measure upon the muscles that are affected; the leg muscles being prone to suffer, and frequently those of the front of the tibia, talipes equinus and equinovarus are the more common.

Diagnosis.—Perhaps it may be thought that there are not many diseases for which an anterior polio-myelitis is apt to be mistaken, and for a careful examiner this may be true; nevertheless the paralyses of infancy and childhood often present difficulties from the very fact that the subjects of the disease are unable to give any account of their sensations, and that they are brought for treatment perhaps months after the loss of power was first noticed. There are several disorders of movement in childhood which have to be considered and eliminated in making a diagnosis; and first of all may be mentioned paralysis due to pressure and nerve-stretching. I have several times been in doubt between infantile paralysis and an affection of this kind. A young child is left playing, perhaps on the hard floor, with but little power of changing its position, and with its nerves unprotected by the ossified prominences which seem made to shield them in later years. There is, at any rate, nothing improbable in the assertion that it was left in health and taken up paralysed. In the upper extremity, nerve-stretching taking the place of direct pressure, may readily lead to similar results.

Supposing there is a doubt about the case, the points to be attended to are alterations of sensation, incompleteness of paralysis, and little if any disturbance of the normal electric actions. The previous history must also be taken into account, although this is liable to mislead in any case.

The paralysis of one arm which occurs as the result of injury to the brachial plexus at birth (Erb's paralysis) must be distinguished from infantile paralysis; the history that it was noticed at birth, or a few days later, the account of a difficult labour, and the characteristic position of the arm (*see* p. 22), will usually make the diagnosis easy.

Where there is much general disturbance at the onset the paralysis is apt to be overlooked altogether; indeed the paralysis may not be present for several days, and some tenderness of limbs may be the only indication of local change. Severe headache, vomiting, and perhaps a convulsion or semi-coma with a raised temperature may arouse a suspicion of on-coming meningitis; or tenderness about the limbs or perhaps stiffness of the neck may suggest acute rheumatism. We have seen both these mistakes made.

Other cases come as paralysis, particularly of the arm, which turn out to be due either to injury or disease of the joint. Injury is very common at the shoulder-joint; acute disease of the head of the bone and cartilage is common at the hip; and for elbow and knee there is a local periostitis, not at all uncommon and generally syphilitic, which may lead to immobility of the limb. To remember the possibility of these is to avoid any error, for all these things are prominently painful. An examination of the joint generally indicates a difference between the two sides, and for the syphilitic affection there is generally a considerable amount of swelling just above the joint; and, of course, if we have to go further, and apply electrical tests, the presence of undiminished electrical excitability should settle any occasional difficulty there might be.

Rachitic and scorbutic paralysis are of the same nature. There are few things more common than to have infants brought for paralysis of the legs, and to find that they are rickety. Rachitic children have very *tender* bones. They are not only *soft*, but they are actually tender, and such children constantly cry when they are handled hurriedly or roughly. But here, again, the existence of rickets should be a diagnostic safeguard, and the persistence of pain makes the solution of the case easy. The same may be said for scurvy.

Infantile paralysis will sometimes need to be distinguished from many other paralyses as they occur in children, and perhaps chief of these is the paraplegic form—from paralysis due to compression of the spinal cord. In this, the paraplegia is often very incomplete; it may be associated with rigidity, and the reflexes, in place of being abolished, are manifestly exaggerated, whilst the muscular atrophy is replaced by mere flabbiness. Some affection of the bladder may also help one to a conclusion, although the irregularities of infants in this way tend to obscure an otherwise helpful symptom. The spinal column should, however, in all cases be carefully examined, as spinal caries and curvature may occur in babies of but a few months old.

Hæmorrhage into the cord (hæmato-myelia) appears sometimes to occur, and a diagnosis might indeed be exceedingly difficult in some cases. It might be expected to be less localised in its effects, and thus rather to produce the symptoms of central softening, with its anæsthesia, its tendency to bed-sores, paralysis of sphincters, and exaggerated reflexes.

Late cases may also be confounded with the atrophic stage of pseudo-hypertrophic paralysis, or progressive muscular atrophy. The latter, however, is rare. In late cases of infantile paralysis the atrophied muscles may be replaced by fat, and pseudo-hypertrophic paralysis is followed by extreme wasting of the muscles. The history must, in these cases, be relied upon. The slow progress of the pseudo-hypertrophy, the characteristic walk, and slow atrophy with long-retained electrical reactions, must serve in most cases to distinguish them.

Before quitting this part of the subject, and as we have already alluded to the occasional occurrence in adults of a similar affection, and now again to the occasional appearance of progressive muscular atrophy in children, it seems worth while, from a diagnostic point of view, to draw attention to the interesting contrast that exists between infancy and adult age as regards the diseases of the spinal cord to which the two epochs are liable.

Acute spinal paralysis is common in children, it is most rare in adults; chronic spinal paralysis is common in adults, and very rare in childhood. Looking a little further into the matter, we can see that this is just what might be expected. Children are subject to sudden and violent febrile attacks, and their tissues are constantly in a state of change and development. Adults are far less liable to the exciting cause, and their tissues have reached a condition of stability that they do not take offence so readily, but when they are disturbed they recover more tardily. On the other hand, the conditions which lead to chronic spinal paralysis and its consequent muscular atrophy are probably quite different; they are in great measure degenerative, or entailed by various local diseases of blood-vessels, capillary hæmorrhages, and so forth, which are not likely to be found in young people at the time of life with which we are now dealing. At the same time, we must be prepared occasionally to find such a case even in childhood.

Prognosis.—Infantile paralysis but rarely threatens life, although complete recovery is the exception. Ross states that if the Faradic response of some muscles and nerves be diminished at the end of five days, and abolished during the course of the second week, these will remain permanently paralysed. The loss of power will, at any rate, be in proportion to the completeness of the loss of Faradic irritability; but so long as there is any reaction to either current, so long some restoration of motive power may be expected. After many months of complete paralysis have elapsed, *a fortiori*, after a year or two—as often happens in hospital cases—any hope of *recovery* is out of place. We can then only look for such amelioration as accompanies the better nutrition of the limb, which sedulous attention may still procure.

Treatment.—The only question that arises is when to commence the application of electricity, or, better, of massage—that is to say, what should be done in the very early stages. It is not often that the disease comes under notice at this time, but if it should, some advocate resorting at once to electrical treatment or massage, whilst others urge that any acute disturbance should be allowed time to subside. There is no doubt that treatment has to be steered between Scylla and Charybdis—those on the one side, seeing the dangers of adding to a process they suppose to be inflammatory, advocate rest; those on the other insist on the early and hopeless degeneration of muscle if some method of stimulation be not resorted to. Now, assuming the observations to be correct which have been made, and that the early stage of infantile paralysis is one of vascularity and cell-proliferation in the spinal cord, I think there can be no question that we should not be too ready to worry the centre into action. I can conceive that great harm may be done in such a case. But we must also remember that the initial process, in all probability, rapidly subsides, and much of the original affection clears up, and when this happens—in the course of five or six days after the onset—we may begin to pay attention to local treatment. Till then I should certainly administer such things as control the circulation—aconite, ergot, digitalis, and iodide of potassium being the chief. I should probably give half a grain of iodide of potassium with a drop of tinct. digitalis every two or three hours; or, if the fever were severe, half a drop of tincture of aconite every hour for a few hours at a time. The iodide may be replaced by a grain of hyd. c. cret. administered night and morning, or a local inunction of mercurial ointment may be adopted over that region of the cord which corresponds to the paralysis. Cold baths, ice compresses to the spine, and so on, would also be advisable in such cases as they might respectively seem suited to.

In the later stages two results may be aimed at—getting some repair in the spinal cord, and keeping the muscles in a good state of nutrition. For the first object electricity is usually advised, galvanism being applied either to the muscles or to the spine. Erb recommends that the poles of the battery be applied to large sponges, one of which is placed over the supposed seat of disease behind, and one on the abdomen in front, and thus a gentle current is transmitted through the cord. He thinks little of the value of the peripheral application, but it is the one more usually adopted. There could hardly be any objection to applying both methods. In the application of electricity to young children, however, there is a great difficulty. Galvanism particularly is often difficult to apply; many a child who will tolerate faradism perfectly will scream when galvanism is used; if therefore it be thought necessary to use electricity, either for testing reactions or for treatment, it is well to begin with faradism. The sensation is a strange one, and frightens them; it must therefore be administered with great caution and patience, the weakest currents being used at first, and for some time, in the hope that the stronger may be more gradually applied. With regard to the use of electricity for treatment, if it causes any distress to the child, it should not be continued. Many children never seem to get over their dislike of the electric battery, its appearance is the sign for screams or tears. We should like to emphasise our opinion that in these cases it is far better *not* to use electricity; the advantage of its use is not sufficient to compensate for the distress it causes to the child.

Massage will serve the purpose equally well, perhaps better if properly done. The rubbing which may be combined with bathing, in sea water, if possible, should be applied frequently and patiently. For this the hand should be well oiled and the part rubbed and shampooed gently for a quarter of an hour twice a day, and when two or three weeks have passed by the child should be encouraged to make what use it can of the limb. For the application of shampooing, or massage as it is called, it is well to have some definite method; the directions to mothers given in Appendix III. may advantageously be followed. The purpose is a gentle yet brisk and thorough stimulation of the circulation and general nutrition of the skin and muscles by passive movements. Patience and a little practice will soon make the nurse or mother sufficiently expert in the finger-tip kneading requisite to act upon the deeper as well as the more superficial groups of muscles. Another important point is keeping the limb warm. A notable characteristic of such parts is their lividity and coldness. They should be enveloped in the warmest wraps, and, in very young children, in cotton-wool. Dr. Marshall recommends two stockings quilted together and filled with bran, which is heated, for maintaining the warmth of the limb.

In the various muscular failures, the action of the antagonising muscles, so far as possible, should be balanced in some way by aiding the weaker muscles by strapping, or bandages, or india-rubber, always remembering that the countervailing power must be applied so as not to impede the voluntary action of the muscles in any way. Of late some success both in the way of correcting deformities and of obtaining more useful movement of paralysed limbs has been attained by surgical measures, particularly by tendon transplantation, a healthy tendon being grafted into a paralysed one; tenotomy also, and in very severe cases the attainment of a stiff limb by excision of a joint may have to be considered. But for details of this kind the reader must be referred to works which specially treat of the subject.

Sunstroke.—Children are by no means immune, even in England, from the dangers of exposure to a burning sun. Not infrequently it happens that children, after being allowed to play outdoors on very hot days, complain of headache, vomit, and have more or less pyrexia.

The following case is probably an instance of such a mild attack:

A little boy, aged three years, had been playing at the seaside for some hours under a scorching sun. He then complained of headache and vomited. The child looked very ill, was drowsy, and the temperature in the axilla was 103·4°. It was feared that he might be sickening for scarlet fever, but next day the temperature had fallen to normal, and he seemed quite well.

But unfortunately the symptoms are not always as mild as this. In some cases there are convulsions, and the child becomes delirious or comatose; there may be stertorous breathing and lividity of the face, and after a few hours or days the child dies, sometimes, as in one case of apparent sunstroke at Great Ormond Street Hospital, with hyperpyrexia.

When recovery occurs in these severe cases there is sometimes permanent paralysis or some mental alteration.

The best treatment for such cases is the prophylactic. When one watches children playing on the beach at the seaside and paddling beneath a blazing sun with little or no protection to their heads, one can only wonder that disastrous results are not more frequent. Nursemaids should be instructed to keep children in the shade on these hot days, and on no account to allow them to go about without proper head covering. The old-fashioned puggaree was an excellent protection, but if this cannot be had, a broad-brimmed hat which can be tilted so as to protect the back of the child's head should be worn. When sunstroke has occurred the application of an ice-bag to the head is useful, especially if there be any high fever. Bromides and a brisk purge should be given, and the child should be kept quiet in a darkened room.

CHAPTER XL.

MYELITIS—NEURITIS—FACIAL PARALYSIS.

Myelitis is an exceedingly rare occurrence in childhood if we except acute anterior polio-myelitis (infantile paralysis), and the changes in the cord which may result from pressure in spinal caries. But cases have been recorded in which an acute or subacute myelitis, exactly resembling that seen in the adult, has occurred in quite young children.

We have seen such a condition following typhoid fever in a boy about ten years old; it has also followed scarlet fever, and in one case under our observation followed influenza in a boy about eight years old.

Sachs records a case where, within twenty-four hours after a slight injury to the back, pronounced symptoms of acute transverse myelitis occurred in a girl aged eight years.

The symptoms have differed in no way from those seen in adults, and any detailed description of them would be out of place here; we would only remind the student that while the occurrence of an acute paralysis of spinal type in a child should always suggest rather an acute anterior polio-myelitis (infantile paralysis), an unusually extensive distribution of paralysis with marked affection of the sphincters, anæsthesia below the level of the lesion, exaggeration of the knee-jerks (when the lesion is above the lumbar region), and the occurrence of bed-sores, all these are symptoms which point to those less limited forms of spinal affection, which are called, according to their distribution, transverse or disseminated myelitis.

Compression of the Cord, which is sometimes associated with inflammatory changes in the cord, a "compression-myelitis," is not uncommon in children as the result of spinal caries. It is important to remember that the symptoms of pressure on the cord and myelitis in these cases do not necessarily correspond to the degree of angular curvature present; indeed, it is not very rare to find paraplegia where there is little or no curvature; and the only evidence of spinal caries may be some stiffness of the back with unwillingness to bend the spine when the child stoops. This is explained by the morbid anatomy of the condition which shows an extension of the process from the vertebræ to the external surface of the dura mater, with a deposit of inflammatory and caseous material here pressing upon the cord; at the region of pressure chronic inflammatory or degenerative changes have been found in the spinal cord.

With caries of the dorsal vertebræ the first symptom may be pain referred to the epigastrium, and may easily be mistaken for some gastric trouble. Weakness of the legs soon becomes apparent, and is associated usually with much exaggeration of the knee-jerks and with ankle-clonus. The plantar reflex may show the extensor response, and is generally very brisk. At a later stage a tendency to rigidity of the legs may be more obvious than weakness.

With caries in the cervical region the upper limbs are likely to be involved as well as the lower, and the diaphragm may also be paralysed, considerably increasing the risk to life.

Anæsthesia may be present below the level of the lesion, but it is often lacking. The bladder and rectum rarely show any affection.

The **prognosis** in such cases is much better than might be expected; even after months of paralysis, complete or almost complete recovery of power may occur, if the spinal disease is checked by rest and proper support.

Treatment.—The one essential is rest, and for a time this means absolute rest in bed; whether drugs have any effect in relieving the paralytic symptoms, apart from such general value as cod-liver oil or malt extract may have for tuberculosis, may be doubted. As power is regained the provision of suitable apparatus in the way of support is a matter which comes within the province of the surgeon.

We may mention here in passing that the significance of the **plantar reflex** in infants and young children, whether it is associated with flexion or extension of the toes, is somewhat different to that in the adult or even in later childhood. The extension of toes on stroking the sole of the foot, which in an adult is taken to indicate some interruption of the pyramidal tracts, may be a normal phenomenon in the infant and young child. Certainly up to the age of two years, an "extensor response" is of no value as an index of disease, and so far as our experience goes the character of the response is normally very variable in children for a year or more beyond that age.

Neuritis.—Apart from the changes in the nerves which occur in diphtheritic paralysis neuritis is rare in childhood, but it may be that it occurs more often than has been supposed, for, as we have already pointed out (p. 551), it seems likely that some of the cases which clinically resemble infantile paralysis are in reality cases of neuritis; and it is at least possible that the same influence, whatever it may be, which produces inflammation of the anterior cornua of the spinal cord in infantile paralysis, may in certain cases cause inflammation of the nerves, either alone or as an accompaniment of the polio-myelitis.

The causation of some of the undoubted cases of neuritis in childhood is as obscure as in some of the adult cases; cold, slight traumatism, some obscure toxic influence, all these have been held responsible. We have known multiple neuritis to follow the use of arsenic in large doses for chorea. Holt records a case of alcoholic neuritis in a child of three years; we have also seen neuritis of malarial origin in a child; and its occurrence after influenza has been noted several times in children.

The symptoms are the same as in adults; there are no special features in childhood requiring mention here. It may suffice to say that when paralysis in a child is associated with much pain and tenderness in the affected part, and with loss of tendon-jerks, the presence of neuritis is probable, and this may be confirmed by a gradual and complete recovery.

Facial Paralysis, of any persistence and completeness, is, in adults, far more commonly due to peripheral causes, such as exposure, than to any known central lesion. In children exposure is seldom in evidence. I have seen such cases a few times, and always in girls of five to eight years; Henoch and Steiner have recorded cases of this kind. Palsy occurs sometimes in infants soon after birth, and is due to injury in delivery. It usually passes off within a short time, but the affection sometimes remains throughout life. A congenital and irremediable form is described by Henoch, the cause of which is unknown.

Abscesses and enlarged glands behind the angle of the jaw also produce facial paralysis; and it has been known to result from congenital syphilis (Barlow); but, more usually, it connotes **aural discharge** and **disease of the middle ear.** Such cases are prone to die from tuberculosis. Disease of the ear may cause abscess of the brain and suppurative meningitis, as in later life; but my own experience quite coincides with that of others, that tuberculosis, in one part or another, is liable to supervene when aural discharge and facial paralysis are coexistent. There is usually extensive disease of the temporal bone in such cases, and perhaps it is thus that it is an evidenec of the tubercular tendency.

Facial paralysis is, therefore, often of very sinister omen in infants and young children.

CHAPTER XLI.

CEREBRAL PALSIES.

Hemiplegia: Infantile Hemiplegia.—When a child with loss of power in its arm or leg is brought for advice there is a tendency in the mind of the beginner to assume that this is due to infantile paralysis. But it is not unlikely to prove on examination to be some other form than an anterior polio-myelitis, for hemiplegia or monoplegia of cerebral origin is not uncommon, and we must recognise a group of cerebral palsies in children as distinct from spinal paralysis.

Hemiplegia in the child as in the adult may be the result of a tumour or of an abscess in the brain, or it may have a functional origin, but under these conditions it is seldom of long duration, inasmuch as in the one case the lesion to which it is due is likely to prove fatal before many months have elapsed, and in the other the paralysis is a transitory condition.

There is, however, a group of cases in which the hemiplegia is permanent, whilst the lesion which gave rise to it is not progressive, but leaves its traces behind in permanently damaged nerve tissue; such a condition is commonly spoken of as "infantile hemiplegia."

Infantile hemiplegia is sometimes congenital, but much more often acquired; in the latter case its onset is usually within the first three years. In Osler's series of 120 cases 15 were congenital, and of the remaining 105 cases, 45 occurred in the first year and 36 in the next two years. There is probably little if any difference in the liability of the sexes; of 24 cases under our observation, 16 were boys, 8 were girls, but some statistics have shown a preponderance of girls.

The onset of the paralysis has been closely related to the specific fevers in some cases: we have seen it occur during convalescence from measles and just after influenza; several cases after scarlet fever have been recorded, and Osler mentions three cases in which it occurred during vaccinia.

Symptoms.—In the congenital cases the weakness is frequently not noticed until several months after birth, for the condition is often one of paresis rather than paralysis, and unless the mother is a close observer it is easy to overlook a slight difference in the movements of the two sides. In the cases which begin later there is usually an acute onset, and in about half the cases—in fourteen out of the twenty-four cases mentioned above—the first symptom is a convulsion, or a series of convulsions. The side which is subsequently hemiplegic may be the more affected in the convulsion, but this is usually general, and associated with some loss of consciousness, which in a severe case may be followed by a semi-comatose condition lasting several hours. The temperature at this time may be raised—in one of our cases it reached 104°—but quickly falls as the convulsive attack passes off. One or other side is then found to be weak or actually paralysed, and at first the face, arm, and leg may be equally affected, but after some weeks or months the weakness in the face usually becomes much less, and the leg also shows less weaknesss than the arm.

In the arm there is almost always some degree of spasticity, and in many cases, if the child is seen three or four years after the onset, there is also some degree of athetosis manifested in a general clumsiness in the movements of the limbs, and an inability to perform the finer movements owing to a certain amount of involuntary action of the muscles, which may indeed be sufficient to produce irregular choreiform movements or a more typical athetosis with splaying out of the fingers and a tendency to over-extend them.

The leg, as a rule, is simply dragged in walking, but ultimately some contracture may occur, and produce some form of talipes. It is not very rare for the leg as well as the face to recover to such an extent that it is only by careful examination, and sometimes indeed only by the history, that the hemiplegic distribution of the weakness can be recognised.

Associated movements on the sound side are sometimes very marked; for instance, a voluntary attempt to squeeze some object with the affected hand is accompanied by a similar but involuntary action in the sound hand.

The tendon-jerks are exaggerated on the affected side, and are often very brisk also in the apparently sound limbs.

There is usually some wasting of muscles in the paralysed parts, and although the condition is primarily one of cerebral origin, growth in the affected limbs is often defective, so that there may be shortening of half an inch or more in the arm or the leg, a point of some importance in prognosis.

With a right hemiplegia as in adults there is likely to be aphasia, but it is not very rare to find some degree of aphasia also with left hemiplegia in these cases, a point of great interest as showing that in early life the word-memory on both sides receives some cultivation, and only in later life the left side becomes predominant; or, at any rate, that one side can more readily take up the functions of the other.

Some mental weakness is frequent with infantile hemiplegia, but actual imbecility, such as is common with the spastic diplegia and paraplegia which result from more extensive lesions of the brain, is unusual in this condition. Many of the children with infantile hemiplegia are extremely excitable and nervous, some are passionate and difficult to control, others are of feeble intellect and too easily pleased.

After the initial convulsions there is usually no recurrence of them for some months or years, but as the child grows older there is a tendency to epileptiform attacks, which must be remembered in giving a prognosis.

The following case may serve to illustrate this condition:

Arthur S., aged three and a half years. Was quite healthy in every way up to the age of two years, when he had a convulsion, apparently beginning on the right side, but soon becoming general, and then affecting the left side more than the right. Some twitching on the left side continued for about twenty-four hours, and the child remained in a more or less comatose condition for another forty-eight hours; he was then found to be completely paralysed in the left face, arm, and leg. The facial paralysis rapidly diminished, so that at the end of two months it was only just noticeable as slight weakness; the leg also improved slowly, and five months after the onset was noted as "weak."

There is now so slight a difference between the two sides of the face that the weakness of the left side can only just be detected when the child smiles; he can run about, but the left leg is dragged slightly, and he tends to walk on the outer side of the left foot; the left arm is weak, there is some rigidity, the elbow is usually kept flexed and the arm drawn in to the side; he can, however, extend the arm to some degree. The movements of the left hand are distinctly athetotic; when he attempts to grasp an object the fingers are splayed out involuntarily, and the thumb spasmodically adducted. He seems quite bright and intelligent, but is said to be abnormally troublesome, is spiteful and passionate; if his wishes are crossed in any way he will lie on the floor and scream. Has had no fits since the onset of the paralysis.

Dorothy W., aged two years. At the age of twelve months, without any preceding illness or convulsion the child was found to be weak in the left arm and leg. She is the third child, and was preceded by a miscarriage at the third month, but otherwise there is nothing to suggest syphilis. Labour lasted twelve hours, but was otherwise normal. There is now weakness of the left arm and leg; the arm is slightly rigid, and the fingers are splayed out in an awkward athetotic manner when she attempts to grasp one's fingers. The knee-jerk is brisker on the left than on the right. When she stands, which she can only do with assistance, there seems to be some spasmodic adduction of the legs. Intelligence seems to be normal.

This latter case raises an interesting point by the apparent affection of both legs with some slight degree of spasticity, although the distribution was chiefly hemiplegic; such cases serve as a link between the cerebral palsies of hemiplegic type and those of diplegic or paraplegic type. There is no essential difference between these conditions; such differences as exist depend almost entirely on the extent of the cerebral lesion, which may be of the same nature in all of them.

Pathology and Morbid Anatomy.—Clinically it is usually impossible to determine the nature of the lesion in any particular case; and indeed even for the morbid anatomist the cause of the hemiplegia is often obscure, for the condition is not in itself fatal, and, as a rule, no opportunity for examining the brain occurs until long after the initial lesion, so that the actual changes found represent often only secondary degenerative processes or terminal conditions which throw little light on the original cause of the hemiplegia.

In the congenital cases we have to distinguish between those in which the lesion occurred in utero, and those in which it occurred during the process of birth. The former would seem to be due either to defective development of the cortex or to degenerative changes from vascular alterations interfering with its nutrition; thus thrombosis of vessels and cavities in the substance of the cortex (porencephalus) have been found in some of the congenital cases. The latter may be due either to the congestion which accompanies asphyxia at birth—and it is noteworthy that a history of asphyxia is common in these cases —or occasionally to hæmorrhage or bruising of the cortex from the use of forceps.

In the cases which occur after birth, the lesions which are most often found are atrophy and sclerosis of part of the cortex, sometimes with formation of cysts or cavities (porencephalus); but these are presumably secondary conditions, and the question is how do they arise? It seems probable that in a large proportion of cases there is some vascular lesion to start with, but the difficulty is to determine the nature and the cause of the vascular lesion. Hemiplegia in an adult is mostly due to apoplexy from atheromatous vessels, to embolism, or to syphilitic thrombosis. But in childhood we can exclude atheroma, and of syphilitic disease of the vessels or of the brain in children we know very little. More investigation is wanted in this direction; one of my own cases came on after snuffles, and Dr. Abercrombie, in a lecture on hemiplegia in children,* alludes to several cases in his series of fifty which suggested the possibility of syphilis. Collateral evidence may help to elucidate this matter. If we take into consideration at the same time with these the group of cases to be next described as spastic paralysis, and most of which are essentially hemiplegic, we shall find that it is not uncommon for these children to have a choroiditis disseminata. Now Mr. Hutchinson† has given reasons for thinking that this disease is often syphilitic. We are at present without any explanation of this association, if we except the vague one of some generally distributed inflammation of nervous tissue; and it seems possible that some cases, at any rate, are of syphilitic origin. Then, it is possible also that some cases of spastic paralysis may be due to a localised meningitis associated with syphilis. Therefore, on the whole, there would seem to be much to be said in favour of a syphilitic origin of one group of hemiplegias.

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* *Brit. Med. Journ.*, vol. i. 1887.

† *Ibid.*

Gowers has suggested that thrombosis of the veins of the cerebral cortex may produce hemiplegia, and, although it seems unlikely that it should bring about hemiplegia of any completeness, I have lately seen a case which makes me think the suggestion by no means improbable for some of the hemiplegic forms of paresis that are met with not uncommonly. The case in point was an infant of four months old, admitted for convulsions and retraction of the neck.* I thought during life that there were momentary spasms or rigidity of the left arm and leg. It was ascertained after death that there was thrombosis of the right lateral sinus, and the intra-cranial circulation had been so much disturbed that there were extensive and peculiar gaps due to softening in the white matter of the frontal lobes and elsewhere. There was extensive suppurative meningitis as well, due in all probability to suppuration of the middle ear which existed. But had the case been one of less severity, and the child recovered, there would have been cysts in the hemispheres, for the morbid anatomists in after years to puzzle over and explain.

As regards embolism, one may wonder that it is not more common than it appears to be. Heart disease is common enough; but it is to be remembered that whenever apoplexy of the substance of the brain is found in young children, a careful search is to be made for an aneurism on some branch of the cerebral vessels, and for heart disease, which, through embolism, is the common cause of the hæmorrhage. The hemiplegia, which sometimes occurs after the exanthemata, is probably embolic, and due either to some endocardial inflammation, or possibly to the detachment of clot, formed in some pouch of the ventricle, dilated as the result of a deterioration of the muscular substance arising out of the fever. Henoch records a case where hemiplegia occurred during diphtheria, and the post-mortem revealed a thrombus in the left auricular appendix and an embolism in the sylvian artery. Dr. Abercrombie, in the paper already alluded to, states it as his opinion that the majority of cases own an embolic origin.

The frequency of convulsions at the onset suggests that in some cases these may not be merely a symptom, but the actual cause of the condition. One cannot but suppose that infantile convulsions may produce in the cortex of the brain an intense congestion which in itself may originate permanent changes, or may be followed by meningeal hæmorrhage, and so produce hemiplegia. The after results of such lesions may perhaps be found in chronic changes in the membranes with atrophy and sclerosis of the cortex, or perhaps a large cyst full of serum and chocolate-coloured fluid containing cholesterine or hæmatoidin crystals. When we find such changes there is, generally from the lapse of time, great obscurity about their origin, but we know that whooping-cough, which produces sudden and extreme turgidity of the vessels of the brain, occasionally causes meningeal hæmorrhage with hemiplegia and death; it is then a reasonable hypothesis that the congestion due to convulsions may sometimes start more chronic evils.

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* *Clin. Soc. Trans.*, 1886.

It has been suggested that some cases of infantile hemiplegia own a similar pathogeny to those due to anterior polio-myelitis, that the cause, whatever it be, which in the spinal cord assails the motor nerve-cells, sometimes fixes itself upon the cerebral elements rather than the spinal and thus causes a cerebral palsy, and it must be admitted that it is sometimes very difficult to tell what is the precise lesion. The following case illustrates this:

Elizabeth T., aged ten, was admitted into the Evelina Hospital for hemiplegia of the left side. Sixteen months before, she had been suddenly seized in the early morning with a screaming fit, in which she failed to recognise her parents, but continually called to her governess not to beat her. It was stated that she became paralysed on the left side, and that her head was drawn to the left side. She was never convulsed. She was shortly afterwards removed to the Gravesend Infirmary, and was there thought to be suffering from tubercular meningitis, more particularly because there was a strong tendency to phthisis in the family. She remained very delirious for a long time, but gradually improved as regards her brain power, although the left hemiplegia persisted. On admission to the Evelina she was a healthy-looking child of hysterical temperament. In walking, the left leg was swung forwards in a pendulum-like manner and with appearance of considerable effort. The left arm was powerless at the shoulder, but she had a fair amount of movement at the elbow and of the fingers. There was considerable wasting of both arm and leg; but the biceps, triceps, and deltoid had suffered more than the remaining muscles. The left arm was $1\frac{3}{4}$ inches smaller than its fellow, and the left calf $1\frac{1}{4}$ inches. The left limbs were colder than the right, and slightly hyperæsthetic. All the muscles reacted well to the Faradic current except the deltoid and the biceps on the affected side. They gave no response. The fundus oculi was natural.

Dr. Osler,* as the result of a large experience, sums up thus: Infantile hemiplegia is probably the result of a variety of different processes, of which the most important are: (1) Hæmorrhage, occurring during violent convulsions or during a paroxysm of whooping-cough. (2) Post-febrile processes, (*a*) emboli; (*b*) endo- and peri-arterial changes; and (*c*) encephalitis. (3) Thrombosis of the cerebral veins. This exactly accords with what we have said as the result of our own experience.

Diagnosis.—It must not be imagined that every case of hemiplegia in a child belongs to this group, which is somewhat arbitrarily separated off as "Infantile Hemiplegia," and in any given case a careful inquiry into the history and the symptoms may be necessary before we can arrive at a diagnosis. Hemiplegia may result from a cerebral tumour; a gradual onset with the presence of headache and vomiting, and optic neuritis may point to such an origin. The presence of a tuberculous mass may be suspected where such symptoms are associated with a history of previous wasting and of discharge from the ears, and perhaps with signs of tubercle elsewhere.

Another cause of hemiplegia, though not a common one, is cerebral abscess. Aural discharge with suppuration in the middle ear may lead to cerebral abscess with or without disease of the petrous portion of the temporal bone, and abscess may cause hemiplegia. It does not usually do so, because the white matter allows of its gradual enlargement without symptoms until it reaches the surface, which then becomes inflamed, and death results from acute meningitis.

Heart disease will account for a few cases by the production of embolism, but in our experience this has been a rare result of simple endocarditis in children: more often it has resulted from malignant endocarditis, itself a rare occurrence in childhood.

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* "The Cerebral Palsies of Children," by W. Osler, M.D. H. K. Lewis, 1889.

The history and the physical signs will serve to distinguish these cases. Very rarely hemiplegia of a transient character has seemed to be due to injury.

Affection of the arm and leg on one side in infantile paralysis must not be confused with hemiplegia. The face, in such cases, shows no weakness, and the paralysis in the limbs is flaccid. There is none of the spasticity, none of the defective co-ordination which is so often seen in infantile hemiplegia.

Functional hemiplegia is not often found in children, but I have seen a few cases, and two well-marked in boys, of which a few details will be given in the section devoted to functional affections.

Lastly, there is hemichorea. To remember its existence, as I have so often said, is to detect it, and thus to eliminate it from hemiplegia in ordinary. But it is quite a common thing for a girl or boy to be brought for paralysis of one side or arm. The child, it may be, has an idiotic expression, and the restless twitch of a finger, a shoulder, or some of the muscles of face or neck, reveals the disease in a moment. But even here some caution is necessary, for chorea is a condition in which definite embolic paralysis sometimes occurs, probably as a result of the endocarditis with which it is often associated.

Spastic Diplegia and Paraplegia.—As already pointed out, there is no essential difference between these conditions and the infantile hemiplegia, or "spastic hemiplegia," described above. The extent of the paralysis indicates a difference in the extent of the cerebral lesion, but either of these conditions may be the result of lesions exactly similar to those found in the cases of infantile hemiplegia. In one respect, however, the bilateral palsies differ from the unilateral, for whilst infantile hemiplegia, as already stated, is generally a condition of postnatal origin, spastic diplegia and spastic paraplegia almost always date from birth. Whether the lesion in these cases is most often of intra-uterine origin or whether it commonly originates during the process of birth may be open to doubt, but certainly in many cases there is a history of difficult birth, often with a considerable degree of asphyxia. With these facts in view these paralyses are often described as "Birth palsies," although it is evident from what has been said above that the same name would be equally applicable to a certain number of the hemiplegic cases.

By the term "diplegia" is meant, if one may so say, a bilateral hemiplegia, so that all four limbs are affected; but just as one meets with cases of infantile hemiplegia in which, although the lesion is almost entirely unilateral, there is some slight degree of affection of the leg on the apparently sound side, so, and perhaps more commonly, one meets with cases which would be grouped with spastic diplegia, but in which, whilst both legs are profoundly affected, one arm escapes entirely, or almost entirely; so that here again we have a connecting link between the cases of infantile hemiplegia and those in which there is bilateral palsy. In the paraplegic cases the limitation of the spasticity and weakness to the lower limbs might suggest at first sight a purely spinal lesion, but the frequent association with mental defects, the existence of transitional cases showing all degrees of hemiplegic and diplegic affection, combined with symptoms exactly resembling those of pure spastic paraplegia, and the frequent history of difficult birth and asphyxia, and of convulsions preceding the onset in all these conditions alike, seem to point to a cerebral lesion as the primary trouble in many at least of the cases of spastic paraplegia.

Ætiology.—As in the hemiplegic cases, there seems to be no special sex incidence; of nineteen consecutive cases of spastic diplegia or paraplegia under our observation nine were boys, ten were girls. In many of these there was a definite history of difficult birth or of asphyxia. Of the few cases which commence after birth some have followed convulsions, and in some the condition has followed shortly after one or other of the specific fevers; we have also seen it associated with congenital syphilis, and the presence of changes in the fundus oculi, such as choroiditis and retinitis, suggest that, as in infantile hemiplegia, congenital syphilis may play a more important part in the causation of these conditions than the history might suggest (p. 568).

Symptoms.—The abnormal condition of the limbs is often not observed until some days or weeks after birth: indeed, in the case of paraplegia, it is sometimes overlooked until the age when walking should begin.

Most of these children are late in learning to sit up even when the upper limbs are not affected, the child may be unable to stand until it is five or six years old, and it may be much later before the child is able to walk alone.

The prominent symptoms are weakness and spastic rigidity of the limbs; the rigidity is usually much more obvious than the weakness, but is not necessarily constant, and is increased by any voluntary effort on the part of the child, and may be induced in some cases by the least disturbance of the child.

In a severe case of spastic diplegia the child is unable even to sit up without support; both arms are more or less rigid, with occasional increase of spasm, so that the elbow may be rigidly semi-flexed, whilst the arm is drawn into the side and the wrist strongly flexed, with the fingers clenched over the firmly adducted thumb; at the same time the legs are rigidly extended and the toes strongly pointed, very often with inversion of the foot, and usually with marked adductor spasm of the thigh, so that the legs may actually cross one another at the knee or just below. Sometimes at intervals the whole body is stiffened, the neck becomes rigid, and in rare cases there is some spasm of the facial muscles; more often, however, the rigidity is only in the limbs.

In many cases the condition is less extreme, and the rigidity only becomes obvious when the child attempts some movement, or is disturbed by handling, or begins to cry. In the upper limbs the rigidity may be a less prominent symptom than the lack of muscular control; all the movements are clumsy, and approximate more or less closely to the athetotic condition, or are rendered ineffectual by a coarse jactitation or choreiform irregularity. In the lower limbs the most important feature is perhaps the adductor spasm, and even in the mildest cases there is usually also some spastic extension and pointing of the toes in the position of talipes equinus when the child attempts to walk. Rigid flexion of the lower limbs, as in Case II. quoted below, is an unusual occurrence.

In the paraplegic cases the arms are normal, but the legs show the same rigidity and spasm as in the diplegic cases, though usually perhaps in slighter degree. As the child lies in bed the legs may show nothing abnormal until they are touched, when the knees at once lock in rigid extension, and it may require considerable force to flex them; when, however, the rigidity is overcome, the spasm may entirely disappear for the moment. As the child walks, or attempts to walk, the gait is very characteristic, the spasmodic adduction of the legs causes the feet to cross one in front of the other, so that the toes of one foot sometimes catch behind the heel of the other, causing the child to stumble; the rigid limbs are dragged along with difficulty, and, owing to the spasmodic extension of the ankle, the toes clear the ground badly.

With all these spastic conditions the tendon-jerks are exaggerated, but often the rigidity is so extreme that it is almost impossible to obtain any knee-jerk at all. The character of the plantar reflex in children is often of doubtful value, but an extensor reflex is found in some of these cases, a point suggesting, at any rate, some secondary degenerative changes in the spinal cord.

In many of these cases there is wasting of muscles in the affected limbs; it may indeed be a marked feature, but on the other hand we have more than once seen considerable hypertrophy from the frequent spasmodic contraction.

There is no disturbance of sensation, nor of the functions of the bladder or rectum. Any picture of these spastic paralyses would be incomplete without reference to the mental condition. As might be expected with a more extensive lesion, the chances of mental impairment are even greater than with infantile hemiplegia; and by the same reasoning one might foresee that with spastic diplegia idiocy is more likely to occur than with spastic paraplegia. Certainly the liability to a greater or less degree of imbecility is very striking in either condition.

Almost all the cases of spastic diplegia are idiotic, and often extremely so; whilst cases of spastic paraplegia also commonly show some degree of mental affection, 45 per cent. were found by Sachs to show "marked idiocy." Even if they are not actually idiots they are backward, or may show some psychical irregularity in the way of precocity or abnormal timidity, or perhaps some moral defect.

Speech is commonly acquired very late. One child with spastic paraplegia only began to talk at five years, another with spastic diplegia could only say a few words at six years, although the mental condition was probably only slightly impaired; and even when speech is acquired, articulation may be very indistinct, and the speech very unintelligible.

These points are perhaps better illustrated by notes of actual cases; the first two of spastic diplegia, the others of spastic paraplegia:

Case I.—Girl, aged six years, brought for backwardness in walking. Was very late in learning to sit up, could not stand until four years old, and even now can only stand with support; first attempt at walking was at four and a half years. Can only say a few words, and these not very distinctly.

Labour lasted nearly twenty-four hours, and forceps were used; the child did not breathe properly for about three-quarters of an hour, becoming "perfectly black" with asphyxia at first. No convulsions at any time.

The left arm is rigidly extended at the elbow, with occasional increase of spasm, the movements of the hand are only partially under control, being clumsy and almost athetotic; on clasping an object with her hand she is unable to relax her grasp owing to the spasmodic clenching of the fingers, which she is obliged to undo with the other hand. The right arm is not rigid now, but the movements of the right hand are a little awkward, and are said to have been more affected formerly. Both legs are rigidly extended occasionally, and any attempt to stand produces rigid extension and crossing of the feet, one in front of the other, with pointing of the toes, so that the child stands on her toes. The knee-jerks are exaggerated, but there is no ankle-clonus: plantar reflex shows extension of the great toe. There is no squint now but there was formerly; the fundus oculi seems normal. The mental condition is evidently weak; and the child is extremely timid.

Case II.—Boy, four and a half years old. Never had any illness, but never able to sit or walk; head large; high arched palate; moves his legs irregularly, with much rigidity of muscles when attempting to walk, and temporary talipes equinus when put on feet. When lying on his back the legs and thighs become rigidly flexed; arms, when attempting to grasp, are shot out in a rigid extended manner, but there is some control of left arm; constant tremor of right arm, and athetosis of fingers.

Case III.—Philip Z., aged four and a half years, unable to walk or talk. He had convulsions at five weeks old, but none since. Labour was easy. The child is idiotic, circumference of head only 19 inches. He is able to feed himself, the arms are apparently normal: both legs, although sometimes quite free from spasm, become rigid every few minutes with spastic extension and adduction, so that they are squeezed close together and tend to cross. The knee jerks are erated, but there is no ankle-clonus.

Case IV.—Arthur B., aged six years, brought for difficulty in walking. Was a seven months child, labour normal, no convulsion at any time; began to walk and talk at two years old. Mentally he is rather dull, there is internal strabismus of the left eye. He can walk alone, but his gait is stiff and clumsy, both legs becoming somewhat rigid, and the feet tending to cross one in front of the other as he walks. The pointing of the toes was very marked formerly, interfering with walking, but a tenotomy of the tendo Achilles was performed with some improvement. The arms and face are not affected.

These may be regarded as typical cases, but many variations in detail will occur; as, for instance, in the following:

Case V.—A boy of six and three-quarters. His paternal aunt became idiotic after fits; a great aunt died in an asylum with brain disease; three other children died with convulsions. The present patient was suddenly taken with vomiting while in bed five weeks ago. A fit followed quickly in which he had deviation of head and eyes to *left*, and loss of power in the right leg. He had many fits afterwards, extending over a fortnight, and since then has lost his memory and power of speech. He does not now recognise his relations. He is idiotic, but does as he is told. The right arm is rigid, jerking in its movement, and tremulous when extended. The leg is in a similar state, although he manages to walk in a clumsy and unsteady manner. Sensation is normal. He is said to have been quite blind when he had the fits, and quite without sensation on the right side, even to the pricking of a pin. The fundus oculi is normal. Bridge of nose rather sunken, but no definite evidence of congenital syphilis.

Case VI.—Girl, eight and a half years. Quite well and intelligent a year ago. Had a bad feverish attack, and was in bed a fortnight. When up again, was unable to use her legs well, but crawled about with a chair for six months, and now cannot walk at all. Has been getting babyish and mischievous for some months; is now more like a child of four in her manner. Both legs very wasted; slight contraction of the flexors of the knee, so that she is unable to straighten them or put the sole to the ground. Pupils equal but sluggish; hearing good, no otorrhœa; teeth peggy, and crammed into the jaw very irregularly.

Case VII.—A girl, aged two years. Early history wanting. The parents are healthy; but one other child has had "fits." This child has a markedly contracted narrow forehead, with a microcephalic appearance and imbecile manner. The fontanelle is closed; there are no protuberances on the skull, and no evidence of rickets; the face is well developed; the arms and forearms are flexed and rigid; the thumbs inturned upon the palms, and the fingers clasped; the legs are also rigidly flexed. Directly she is touched the whole body passes into a state of rigid spasm, lasting for a few seconds.

The sight is deficient in certain directions, and there are large patches of choroidal atrophy with central pigmentation. Both of the discs are white, with pigmented borders, and on the right side one of the atrophic patches occupies the place of the yellow spot.

Morbid Anatomy.—It seems probable that a large number of these cases are due to hæmorrhage, meningeal, or possibly cerebral, as a result of venous congestion or of the use of forceps during birth; such a condition has actually been demonstrated, but in almost all the cases the examination of the brain has been made some years after birth, and the changes found have been similar to those in infantile hemiplegia, but rather more extensive.

The frequent association of some degree of microcephaly with these spastic conditions, whether paraplegic or diplegic, affords some clinical evidence of their cerebral origin, and in some cases the degree of microcephaly is such as to suggest that the arrest of development of the brain has occurred during intra-uterine life. The following case is worthy of record in this connection:

A girl of two and a half years was thought by its parents to have been idiotic since four months of age. It had never had any fits. At five months its limbs were noticed to be rigid. No history of congenital syphilis could be elicited. It was idiotic in appearance, with a small forehead. The eyes and head were moved about in a restless but yet partially intelligent manner, and all four extremities were in a condition of rigid flexion, which varied in degree somewhat from time to time. There was internal strabismus and much choroidal atrophy on both sides, the disc itself being healthy. It was seized with severe diarrhœa and pyrexia, and sank.

At the autopsy there were a few adhesions about the cerebellar fossa, and perfect fusion of the dura arachnoid to the posterior surface of the cord in its entire length. Sections of the cord looked healthy. The lateral ventricles were dilated, and contained half a pint of fluid, mostly collected in the posterior part. But the brain was chiefly remarkable for the undeveloped state of its convolutions. The frontal were sufficiently well marked on the convexity, but behind them no others were distinguishable, the surface being practically smooth and uninterrupted by any sulci. No rickets. No evidence of syphilis.

Prognosis.—The outlook in these cases is more hopeful than their appearance during the first few years might suggest. In all but the most extreme cases some degree of improvement occurs. A child who, at the age of three or four years, is so rigid and spastic that he is unable to stand, and there seems to be no prospect of his ever making use of his limbs, will often improve so much that by the time he reaches the age of eight or nine years he is able to walk after a fashion, and to make some use, albeit clumsily, of his hands. Even the mental condition often shows distinct improvement. A boy who at two and a half years old was quite imbecile and unable to stand, with rigid spasm flexing the legs and some strabismus and nystagmus, when seen again at ten and a half years had become much more intelligent, had learnt his letters, and could walk about very fairly, although clumsy with his feet. But the improvement is only up to a certain point; the weak-minded child will remain weak-minded, and the movement will always be awkward and stiff. Moreover, the possibility of convulsions occurring as the child grows older must be borne in mind.

Treatment.—But little can be done medicinally. If there be any definite lesion, iodide of potassium or iodide of iron might possibly prove useful, and bromide of potassium and sodium, or one of these combined with the iodide, may be given to control the fits. All possible practice should be given to walking, and to as many definite muscular movements as possible. Regular daily shampooing is also of service. Electricity has not seemed to us to be of much benefit. Occasionally surgical measures particularly tenotomy may be useful for the correction of deformities.

CHAPTER XLII.

MUSCULAR ATROPHY AND PSEUDO-HYPERTROPHY.

Pseudo-hypertrophic Paralysis is a disease which attacks children almost exclusively, and appears to run in families, affecting several members of the same stock. Those affected are nearly all boys (190 out 220, Gowers), and as with hæmophilia, it descends to the males by the females. The family occurrence, however, is by no means always in evidence; indeed, in our own experience it has been rather the exception than the rule. The essential features are enormous buttocks and calves, associated with great muscular feebleness, so that the gait is peculiar. The other muscles of the body are usually feeble, or even wasted, but they seldom show enlargement comparable to that of the calf and buttock. The disease is of such slow progress that few seem to have been able to watch its onset, and, lasting as it does for years, not many cases of death are recorded. It appears, however, to lead slowly to a fatal issue, either by general muscular atrophy and difficulty of respiration, or by marasmus.

Symptoms.—In most of the cases the symptoms date from very early years, most of the cases under our observation have shown definite weakness before the age of seven years, and the symptoms are usually pronounced by the time the child is ten years old. It is not unusual to obtain a history that the child has always seemed weak, and learned to walk very late; in one of our cases walking was first acquired at four years, in another at six years. Many of these children stammer, some are of feeble intellect; in some a foolish appearance is produced by the tongue being protruded between the teeth, and the mouth kept slightly open. According to Chwostek there is actual enlargement of the tongue sometimes, and this seemed to be so in two of our cases.

The disorders of movement of patients affected with pseudo-hypertrophic paralysis are chiefly dependent upon weakness of the muscles of the lower extremities. Feebleness of gait is first noticed, and frequent falling; there is difficulty in walking upstairs, the legs are kept wide apart for the sake of steadying the badly balanced trunk; in walking there is a half-rotatory, half-shuffling movement to enable the forward step to be taken. Next there is a difficulty of getting up from a recumbent position, the movement being accomplished by the hands, which, placed upon the knees and thighs, push the trunk upwards to supply the action of the paralysed extensors. As the result of the paralysis of the extensors of the pelvis on the thighs, lordosis becomes marked when the boy stands, although whilst he is sitting the position may be rather one of kyphosis from the general weakness of the back muscles; later there is talipes equinus, and the patient cannot get his heels to the ground. The calf-muscles are usually the first affected, then follow the glutei, and ultimately other muscles of the thigh, pelvis, trunk, and upper extremities. One of the most constantly enlarged muscles is the infra-spinatus, we have sometimes seen this greatly enlarged where the pseudo-hypertrophy elsewhere was not very striking. Certain muscles are usually wasted rather than enlarged, particularly the lower part of the pectoralis major and the latissimus dorsi, and as a result of this the axillary folds are often very deficient. The pseudo-hypertrophy is a very variable element, but in most cases a great deal of quiet atrophy may be going on in various parts, obscured by the obtrusiveness of the parts which are enlarged.

But it is not only hypertrophy or atrophy of muscles which should arrest attention in this disease; a very important feature is hardness of the muscles, and this together with the weakness may be the only evidence of affection in certain cases. As an example both of the variability of the hypertrophy and of this induration we may quote the case of a boy, aged eight years who was in the Evelina Hospital, with decided prominence of the calves but wasting of the muscles of his arms and shoulders; some of these latter, however, might have passed for normal, but for their peculiar hardness, which made it evident that they were undergoing the changes which in the calves had produced the enlargement.

Eventually the weakness becomes extreme, and the child is quite unable to stand or even to raise himself into the sitting position without support; the respiratory muscles may also become involved, giving rise to a peculiar laboured respiration, and in such cases some respiratory complication is likely to end the scene.

These points may be illustrated by notes of cases, which may also serve to emphasise the variability of the muscular condition in this disease.

Ernest M., aged twelve. His father is a very drowsy man, and suffers from intense headache. His mother has had rheumatism twice, and three years ago some nervous affection, for which she consulted Dr. Wilks. One of her children has died of "water on the brain," and another of "cleft palate."

This boy, when he first began to walk, at fifteen months, was noticed to do so in a strange way, walking from his hips, swaying from side to side, and not bending his knees. When four or five, he improved slightly, and could walk for short distances without the aid of sticks. This continued till he was about nine, he being able to walk and play in a manner, but never like or with other boys. At nine years old his powers of locomotion again deteriorated; he refused to go out, and when walking would help himself by means of chairs, &c. For the last twelve months he has been carried about. It was also noticed that while his body was becoming thin and emaciated, his calves and gluteal regions were well developed; in walking about he protruded his buttocks, and his back was arched. His parents think that for four or five years his arms have become thin and wasted. His mental condition has always been good. He is a pale boy with stammering speech, but sharp and intelligent. He lies in bed, and experiences the greatest difficulty in turning over. After much effort, he can manage to raise himself on his knees; but he has to support himself with his arms. His legs are spare, and there is talipes equinus of both feet. His calf muscles are not large, but they are remarkably *hard;* and when he lies in bed there is an unusual gap between the thighs, which suggests that there may be something wrong in the setting of his hips; but this is probably due to wasting of his adductor muscles.

His lower limbs are capable of every variety of movement, but in a very feeble way. He takes his hands to help his legs when he wishes to cross one leg over the other. Tendon reflexes are all absent. Skin reflexes are all present. When he is placed on his feet his buttocks protrude and his spine becomes much arched, but probably only because in this way alone can he compensate for the talipes, and put his feet flat to the ground.

With electricity, all the muscles, leg, arm, and trunk, fail to respond to a weak Faradic current; to a strong one the left arm and leg act more than the right, and the trunk muscles act rather better. To a galvanic current applied to the muscles there is some response to fifteen cells. Electrical sensation is much diminished below the knees. Ordinary sensation is undiminished.

This case was seen by several physicians and surgeons, and various views were entertained of its nature; but I ultimately came round to the opinion, originally entertained, I believe, by Dr. Moxon, that the case was one of the atrophic forms of pseudo-hypertrophic paralysis.

Case II.—A boy of three and a half years. Had good health until five months before his admission. He was then languid and ill, and if he attempted to walk would fall down. He retched in the morning for a week or two. When seen by Dr. Willcocks, five or six weeks after this onset, he could walk in a tottering manner, with his legs much apart, but if laid on his back he could not get up again. About this time internal strabismus appeared. Now he can roll over, but cannot walk at all. The superficial reflexes are normal; the deep are absent, save slight clonus at the right ankle. His limbs are plump, and there is moderate hypertrophy of the calf and gluteal muscles. The lumbar muscles stand out considerably when he sits up in bed, which he can do with a forward lean. He is unable to stand alone, falling forward if unsupported. In walking with support he throws his legs helplessly about, and keeps them wide apart. In attempting to raise himself from the ground he rolls over, and rests his arms on his knees, but without effect so far as getting up is concerned. There is no lordosis. The electrical reactions are normal with both currents.

Case III.—A boy of nine. Began to walk at the age of twenty months, but he had always been weak and never able to get about like other children. He had gradually improved without any treatment, and was stated to walk much better than he could two years ago. He could walk about the ward quite well, but like Case IV., he had great difficulty in mounting the stairs. He could only accomplish this by hanging on the balustrades, and pulling himself up with his hands. Further, he could not rise from a sitting posture.

He would get on his hands and knees and blunder about, and, when he would seem almost to have accomplished his purpose, would roll over again. He was a spare boy, of average intelligence, and without anything that could be called hypertrophy of the muscles; but to very careful examination the muscles of his thigh, and particularly the extensor cruris, had a hardened feeling which was suspicious. His thigh muscles failed to act to Faradism in any way, but they acted to twenty-four cells of a constant current. There was no patellar reflex on either side. He was galvanised and shampooed with much regularity for four and a half months, but very little improvement resulted.

Case IV. was a boy of six or seven years, much like the last-mentioned case, who was brought to me because he could not walk upstairs, or pick himself up from a sitting posture. If sitting on the floor, he would turn over on his hands and knees, but the weakness of his glutei and the extensors of his legs and thighs was such that he could not get himself into the erect posture without assistance. When he was erect he had no trouble in walking or running about, though I believe he was apt to tumble occasionally. He was a very spare boy, but the muscles were not definitely wasted, and I supposed his case to be one of this group.

Morbid Anatomy.—In all cases where an examination has been made, the affected muscles have been found to be—if in an early stage—separated by an abnormal growth of fat in the interstitial tissues; if the stage be late, they are *replaced*, or rather crowded out, by fat. The evidence as regards the state of the spinal cord is contradictory. The examinations of the cord in such cases have not been many, and it has once or twice been found diseased; but the general opinion at present held seems to be that the affection is a local one of muscular origin.

Diagnosis.—The distinctive features of the disease are the slow progress and the very gradual loss of electrical power—a loss corresponding to, but following, the wasting; differing thus from that of infantile paralysis, or anterior polio-myelitis, which precedes and is out of proportion to the wasting. But a time may come nevertheless, when the muscles, being in a state of complete atrophy, it is impossible to recognise the characteristics of the disease, and in which it is difficult to distinguish between it and progressive muscular atrophy.

To my mind this is an important point. The elephantine buttocks and calves associated in some cases with feeble intellect form a clinical picture which perhaps no one could well mistake; but when we say that the pseudo-hypertrophy may be little, the muscular atrophy very general, and that in any case of muscular atrophy a growth of fat may appear and replace the muscles, the distinction is by no means always easy.

As a general rule, the history will allow of its distinction from infantile paralysis, which comes on suddenly; the electrical reactions are also distinctive, for whilst in infantile paralysis the reaction of degeneration is likely to be present, it is characteristic of pseudo-hypertrophic paralysis and the allied group of primary muscular atrophies or myopathies, that the reaction both to Faradism and galvanism undergoes simply a gradual diminution with no qualitative changes; progressive muscular atrophy is rare in childhood, and when it does occur is more likely to involve the intrinsic muscles of the hand which are hardly ever affected by pseudo-hypertrophic paralysis.

In the diagnosis of cases with much muscular wasting one must bear in mind that there are cases in which the pectoral muscles or portions of them are congenitally absent. We have seen a child with absence of the sterno-costal portion of one pectoralis major in whom the curious asymmetry produced thereby was mistaken for the result of chronic lung disease; and it would be easy to confuse such a congenital deficiency with the atrophy associated with pseudo-hypertrophy, particularly as the muscle which is most wasted in that disease, namely, the lower part of the pectoralis major is also the muscle which is most often congenitally deficient. The pectoralis minor and the latissimus dorsi may show similar deficiency, and congenital absence of part of one or more ribs may also occur as we have seen, usually in association with muscular defect.

Prognosis.—It does not appear to have any tendency to ameliorate. Its course is very chronic, and may last from childhood to puberty. Death usually comes at last from exhaustion or from some intercurrent disease.

Juvenile Type of Muscular Atrophy (Erb).—Under this name has been described a variety of primary muscular atrophy which is supposed to be distinct from pseudo-hypertrophic paralysis. It is characterised by wasting of the muscles of the shoulder and upper arm, and of those of the pelvis and thighs. In the upper limb the deltoid and supra- and infra-spinati muscles are most affected at first, and in both limbs the distal part of the forearm and leg escape. But it may be doubted whether there is any sufficient reason for separating these cases from those of pseudo-hypertrophic paralysis, for in this "juvenile type" an exactly similar hypertrophy sometimes occurs; for instance, in the deltoid and spinati muscles.

Yet another group has been described as the facio-scapulo-humeral type, in which the atrophy begins in the face and then spreads to the shoulders; the Landouzy-Déjerine type it is sometimes called. The child is unable to whistle or show its teeth, or to close its eyes tightly, and later some weakness and wasting of the shoulder muscles is noticed.

But here again some latitude must be allowed; the pelvic muscles may be involved, and it seems that enlargement of the calves may also occasionally occur, so that the group differs little from the previous group, and is evidently a near relation to the hypertrophic cases described above.

Peroneal Atrophy (Tooth).—In this variety the first symptom is wasting and weakness of the extensor muscles of the toes and the peronei, resulting in some dropping of the foot, together with a certain degree of inversion, so that the position of the foot approximates to a talipes equino-varus; subsequently the upper limbs become involved, and eventually the hand may be affected, with the production even of a "claw-hand." Vague pains may be present in the affected part. The knee-jerk is gradually lost.

This disease has been called the peroneal type of progressive muscular atrophy. Its exact position from the point of view of pathology has yet to be determined; it would seem to be quite distinct from the primary muscular atrophies described above. Both peripheral and spinal changes have been found in it, but so few autopsies have been recorded that we may well hesitate to assign its place more exactly as yet.

Progressive Muscular Atrophy of spinal type, resembling more or less closely that seen in adults, has occurred but very rarely in childhood, with the characteristic early wasting of thenar and hypothenar eminences, the slow spread of the atrophy with fibrillary contractions, the development of the claw-hand, increasing weakness, and gradual loss of deep reflexes.

I am in doubt whether the subjoined case comes under this heading or not :

A boy of nine came for wasting of his right hand, which had progressively increased for two and a half years, but had been stationary for six months. The hand ached much at first when he attempted to write ; and latterly he had had pain and weakness in the outer side of the arm. He had never had any fit.

He appeared healthy, but there was extreme wasting of the muscles of the right hand and of the forearm. The forearm near the elbow measured $\frac{3}{4}$ inch less than its fellow.

Every now and then cases occur in quite young children, sometimes even in the first year of life, where the prominent symptoms are progressive muscular wasting and weakness, but neither in the distribution of the muscular symptoms nor in their course do they altogether correspond to any of the conventional groups. In some of these, weakness of the neck and trunk muscles is the early symptom, and is followed later by wasting and weakness in the extremities with loss of deep reflexes, and it may be with development of the typical "claw-hand," even within the first few months of life ; in such cases there is sometimes a history of a similar disease in other children of the family (the Hereditary Progressive Muscular Atrophy of Hoffmann).

Any attempt, however, to draw hard and fast lines between various types of progressive muscular atrophy must needs be unsatisfactory in the present state of our knowledge. Clinically, these types tend to run one into the other, and pathologically, while it has been shown that some are associated with a chronic spinal lesion, a degenerative change affecting chiefly the anterior cornua, yet others appear to be the result of a local neuritis, and others again in the absence of demonstrable cause appear to be some idiopathic muscular failure.

Treatment.—There is little to be said under this heading ; all these conditions are incurable, and no drug has any influence upon them. It is very advisable to do everything possible to maintain the nutrition of such muscle as exists, and this can best be done by regular massage and by electricity ; and inasmuch as sooner or later these children will take permanently to their beds, and probably then deteriorate more rapidly, it is advisable to keep them upon their legs to the last possible moment.

Hemiatrophia Facialis is a very rare condition, but some forty or fifty cases have been recorded. Two very striking ones, with photographs, have been published by Messrs. Jessop and Brown, from Dr. Gee's wards, in the *St. Bartholomew's Hospital Reports.* The disease is not exclusively infantile; but Gerhardt has collected ten or twelve cases in children, and Mr. Jessop states that thirty-five began before the age of twenty.

It is characterised by wasting of the muscles of one half of the face, generally the left. The palpebral fissure narrows, the eye sinks in, the cornea becomes ulcerated, and the eye destroyed. In many of these cases there is neuralgic pain and some early pigmentation of the skin.

Facial hemiatrophy is also associated with congenital torticollis, and any prolonged torticollis may cause some arrest of development of the face on the affected side.

We may mention here as a rare condition, which is sometimes associated with some facial asymmetry, the so-called *Sprengel's Shoulder.* The shoulder on the affected side is higher than on the other, and appears to be smaller; the scapula is placed at a higher level, and its upper angle projects so as even to simulate in some cases an exostosis here. The scapula in some of these cases is poorly developed, and some degree of lateral curvature of the spine may be present. Dr. Hughlings-Jackson has suggested that in such the fault is in the lower third of the trapezius, which has been found to be weak and poorly developed. In some cases certainly, the condition is congenital, and it is noteworthy that it has sometimes been associated with various congenital malformations in other parts.

CHAPTER XLIII.

ATAXIC CONDITIONS.

Friedreich's Disease, or Hereditary Ataxy, is a rare condition, but begins almost always in early childhood. It is probably not actually congenital, although some cases give a history of unsteadiness in movement dating from infancy; the symptoms are usually well marked at the age of ten or twelve years. Its onset sometimes follows an acute illness. Dr. Ormerod* has described two series of cases occurring in two families—three in one, two in the other. The affection seems to be hereditary, and to occur in families in which the progenitors showed nervous disease of one kind or another; it occurs, however, not very rarely in children with no evidence of heredity whatever. The disease affects boys and girls about equally.

Symptoms.—The children in whom it occurs are often backward children from the first, late in learning to walk and to talk, and perhaps early show signs of being "not quite like other children." At a variable age, but generally within the first six years of life, some ataxy appears, quite gradual in its onset, but precipitated apparently in some cases by the occurrence of one or other of the specific fevers. The ataxy is generally not very extreme: it affects the upper limbs perhaps as much as the lower, but may only be elicited in them by testing the finer movements of the hands. Some unsteadiness of the head is sometimes associated with this ataxy of the limbs. The gait is generally unsteady rather than actually reeling, the child walks with the legs wide apart, and in a more advanced stage the gait becomes staggering and uncertain.

Some degree of pes cavus or talipes equino-varus is a frequent and characteristic feature of the disease, and its supervention may still further alter the gait. The great toe is commonly over-extended at the metatarso-phalangeal and semiflexed at the proximal phalangeal joint, but this position is not peculiar to Friedreich's disease ; it is seen in several other chronic nervous diseases. There is some degree of lateral curvature of the spine in most cases sooner or later.

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* *Medico-Chir. Trans.*, 1885.

The tendon-jerks vary : in some cases, probably in most, they are lost ; in others they are exaggerated.

The facies in this disease is often stolid and dull without being actually idiotic. The speech is slow and spaced and often thick and indistinct. The eyes show some nystagmus on lateral deviation ; there are no pupil symptoms, and as a rule no changes in the fundus ; optic atrophy is rarely seen. Sensation is normal and apart from the mental condition the functions of bladder and rectum are not affected.

I have notes of several such cases :

In one case it was apparently hereditary, for the father was so unsteady in his fingers that he could never button his shirt-collar ; whilst his son, a boy of six, wrote his name in a series of unintelligible zigzags, and in attempting to steady himself to put a glass of water to his mouth, the muscular movements became violent. This affection had been noticed ever since he first began to play with bricks, but he had never had any fits or any illness. He was a sharp, nervous child, and easily frightened by sudden noises, and then lost his self-control and stammered.

In another case the boy was thirteen and a half years old. Both his parents were alive, but his father was described as consumptive and his mother as delicate. There was epilepsy in the family. He said that as long as he could remember—and a relative who brought him said since babyhood—he had always been feeble and tottering in his walk, his head apparently too heavy for his body. He had always had a difficulty in dressing himself, and he would be often untidy and dirty. His feebleness and irregularity of movement had increased of late. He was a spare boy, but his muscles—what there was of them—were well developed. He spoke in a slow, jerking, staccato way, quite like that of insular sclerosis, and his whole manner gave me a like impression. His intellect was clear. His head was constantly nodding, like a case of paralysis agitans, but more forcibly than is usual in such a case, and when he walked he staggered about like some cases of tumour of cerebellum or pons. There was, however, an absence of the excessive irregularity of the muscles under the influence of volition, such as characterises insular sclerosis. He had fair power in both his arms, although the grasp was feeble for a boy of his age, and the left side worse than the right. He could pick up small objects at times perfectly well; at others only with some tremor and uncertainty; and as a rule, in drinking he put his head to the cup, his hands being too unsteady for the purpose. He would lie and sit quite quiet. Movement was accompanied by the rhythmical head movement. He had good power in his legs, and could lift them without tremor. He walked with his legs wide apart, and their movements were jerky and inco-ordinate, his heels coming to the ground like a case of locomotor ataxia. He was unable to stand with his feet together and his eyes shut.

The abdominal reflexes were well marked—the cremasteric feeble. The patellar tendon reflexes absent. He said, on being questioned, that he often had darting pains in the calves of his legs, and pins and needles in his hands and feet.

His sight was very imperfect; he could only read Snellen's 18 at 4 feet, 0·5 at 4 inches. His pupils were sluggish; the optic discs white, a condition Dr. Brailey considered to be one of slight atrophy. He had no trouble either in urination or defæcation.

He was under observation for a month, the treatment adopted being faradisation of the spine three times a week. We thought that he was decidedly steadier under this treatment.

Another case, a child of six, had had a fit, and was idiotic, though sensible enough to express his satisfaction that he had "done with the doctors" after we had finished examining him. He used his hands in an ataxic way; got at a button of his waistcoat with difficulty; and only after many efforts, in which the arms made wide excursions, did he succeed in unbuttoning. This child spoke slowly and laboriously, and walked in a tottering way, and would fall quickly if not held up.

All these were boys. In a girl of four the disease came on after "brain fever:" probably the initial fever of measles and whooping-cough which she had at that time.

I have recorded, at the Clinical Society of London, in conjunction with Dr. Carpenter, five cases in one family, which may well be included in this group, although the clinical symptoms are more those of insular sclerosis. The ages of the children are eight, six and a half, five, three years, and fourteen months. The eldest is the most severely affected, the youngest as yet having only nystagmus. In these cases the knee-jerk is *exaggerated*.

Morbid Anatomy.—The anatomical changes in the few cases that have come to an examination have been diffuse grey changes in the spinal cord occupying various tracts, although in most of them the sclerosis of the posterior columns has been profound.* With the affection of the posterior columns, there is also usually sclerosis of the lateral columns, and other parts which have been occasionally affected are the direct cerebellar tract, and the cells of Clarke's vesicular column. It seems likely that although the symptoms are not congenital, the disease is the result of some developmental tendency.

Prognosis in this disease can only be unfavourable. The disease is slowly progressive, and after some years the child may become a helpless cripple. Its duration would seem to be very variable. Death occurs from some intercurrent disease.

Treatment.—No drug treatment seems to be of any avail: we can only treat symptoms as they arise. Massage and electrical treatment may be of some value in preventing the deformity of the feet, but are not likely to have any influence otherwise on the progress of the disease.

Acute Ataxia.—Occasionally as a sequel of acute disease, particularly after infectious fevers, children become ataxic with some tremor on voluntary movement and with nystagmus. The symptoms in fact are such as might suggest disseminate sclerosis or a cerebellar tumour. There is, however, no optic neuritis, and the course is steadily towards recovery which after two or three years may be complete. The lesion which has been found in these cases is an acute inflammation of the cortex cerebelli, an encephalitis limited to that portion of the brain.

It may be doubted whether any treatment has much influence upon this condition, but in the acute stage the child should naturally be kept at rest in bed, and potassium iodide should be given for several months.

Congenital Ataxia.—There are cases of ataxia in children which, whilst they present some of the features of Friedreich's disease and some of disseminated sclerosis, yet differ from both these conditions in some respects, and in particular are sharply differentiated from all such acquired affections by the fact that the ataxy is congenital. Dr. Batten recently showed four such cases at the Neurological Society * and the history, symptoms, and course were so constant as to justify their description as, at any rate, a distinct clinical group, although at present their pathological identity remains a matter of surmise.

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* Dr. G. N. Pitt has published in the *Guy's Hospital Reports*, vol. xliv. p. 369, a very complete account of the post-mortem examination of another case.

The only symptom which attracts attention at birth may be nystagmus, but towards the end of the first year, when the infant should be able to sit up, and attempt to walk, all the movements are noticed to be shaky and uncertain. The ataxy at this stage, and even for a year or two longer, may be such as to make walking impossible, but gradually more control is acquired, and the child learns to walk, perhaps not till four or five years of age. The ataxy of the limbs is of a coarse character, and the child is apt to tumble in walking. The head is also very unsteady in some cases. Talking is acquired later than normal, and the speech is of a curious drawling and sometimes jerky character.

A slight difficulty in swallowing, so that the child is obliged to eat slowly, has also been observed. The knee-jerks are unduly active.

The following case under our care appears to belong to this group :

Nellie N., aged four years and nine months. Instrumental birth ; mother had eclampsia during labour. The child began to walk at eighteen months, but has always had difficulty in walking owing to the ataxic condition. Speech has never been clear.

The child is very intelligent, almost precocious. The head as well as the limbs is unsteady, and when the child walks she staggers to either side, and the whole body seems ataxic ; sometimes she lifts her feet high, almost like a case of locomotor ataxy. She has some difficulty in touching her nose with her left forefinger when the eyes are closed. Speech is indistinct but hardly staccato. There is no nystagmus or squint. The child has always had some difficulty in swallowing fluids, has to drink slowly and in small quantity ; she has no difficulty with solids. The knee-jerks are brisk. The plantar reflexes show flexion.

The most satisfactory feature of this condition, and one in which it differs from Freidreich's disease, is its tendency to remain stationary, or even in some of the cases to improve as the child grows older.

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* *Brain.* Spring. 1901, p. 171.

The morbid anatomy of this condition is at present unknown; there is much to suggest some faulty development in the cerebellum, but the lesion may well be of wider distribution, and when one compares the symptoms with those of Friedreich's disease in which the cord lesion has been associated in individual cases with some atrophy of the cerebellum, and as occasional alterations of the mental condition suggest, probably with some affection of the cerebrum also, it seems likely that extensive histological changes will be found in these congenital cases.

Treatment must consist in educating the muscular control in every possible way: a little ingenuity will easily devise some method suitable to the particular case; for instance, the hands may be trained by the effort to place pegs in holes made in a board for their reception, or by pricking holes along an outlined pattern on paper, whilst the gait may be improved by patient practice in walking along a narrow board, or by attempting to touch some small object with the toes. Whatever exercise is adopted, patient and irksome practice will be necessary if any good is to come of it.

Ataxy, however, is a symptom of several other conditions beside the two which have been described above, and which are rare indeed: and when a child with staggering or reeling gait, and perhaps some jerky or tremulous action of the arms, is brought for treatment, there are several possibilities which will have to be considered in making a diagnosis.

The first thing that occurs to one is the possible existence of a tumour in the cerebellum or in the pons. A tumour in the cerebellum, particularly in the middle lobe, commonly produces a staggering inco-ordination of the lower limbs so that the child reels from side to side or in some particular direction in walking. The arms are less likely to be ataxic in these cases than with a pontine tumour, with which there is often a general unsteadiness of movement, or it may be a coarse jactitation of one or more limbs not unlike the movements in disseminated sclerosis, and like these brought on by voluntary action. The gradual onset of the symptoms with headache and vomiting, and the presence of optic neuritis, may point to an intra-cranial tumour, but one must be prepared to meet with cases in which any one of the cardinal symptoms of such a tumour are lacking; indeed, all three of them may only make their appearance after the inco-ordination has been present for weeks or months.

Then again there are cases of diphtheritic paralysis, in which the inco-ordination is the obvious symptom, whilst the weakness and local paralyses are much less in evidence. It is not very rare for such a child to be brought with the complaint that " he tumbles about " and " staggers in walking " ; and it is only on further inquiry that a history is elicited of some recent sore-throat which had not been thought serious enough even to require medical attendance. Careful examination will probably reveal other symptoms of diphtheritic paralysis, a nasal voice, or perhaps some weakness of the external rectus of the eye, and almost certainly absence of knee-jerks.

Sometimes the jerky irregularity of chorea may simulate and be simulated by the ataxy of an intra-cranial tumour, and when the headache, which is so frequent in chorea, is also considered the difficulty may be still further increased. We have seen the mistake made with a tumour in the corpus striatum, where the nature of the choreiform movements was only determined by the discovery of advanced optic neuritis. As described in the previous chapter, a coarse jactitation or a clumsy irregularity of movement is also a feature of spastic paralysis, and may indeed be a much more noticeable feature than the weakness or spasticity, but the history, together with the distribution in the hemiplegic cases, and the gait with its tendency to adductor spasm, will suggest the nature of the case.

Lastly, we may mention the faulty control of movement resulting sometimes in choreiform irregularity, sometimes in a mere clumsiness of action, which is not infrequently associated with idiocy or imbecility, apart from any evidence of gross lesion in the brain.

CHAPTER XLIV.

HEAD-NODDING—NYSTAGMUS.

Head-nodding (*Spasmus Nutans*).—This curious affection characterised by rhythmical movements of the head associated with nystagmus is almost exclusively a disorder of infancy. Its onset is usually between the ages of six and twelve months; very rarely it has begun earlier (in two recorded cases, as early as six weeks), and hardly ever after the eighteenth month—in one case recorded by Eberth at twenty months, in another by Hadden at nineteen months.

It has a very definite seasonal relation, it seldom begins in the summer months; fully two-thirds of the cases have their onset between the beginning of November and the end of February; in this respect it may be compared with tetany, which also has its maximum incidence during the cold weather.

Symptoms.—The head movements vary in different cases, three varieties may be recognised, a pure nodding movement as in affirmation, a rotary movement as in negation, and a lateral or side to side movement. The nodding movement from which the affection gets its name is probably not the commonest, more often the combination is rotary and nodding, producing a kind of pendulum movement.

These movements are regular and rhythmical in character, the rate is about 1–2 per second, but they are not constant; a series of movements lasting ten or fifteen seconds will often be followed by an interval of the same, or longer time, in which the head is quite steady. There is no jerking and it seems to cause the infant no discomfort whatever. It can generally be stopped by suddenly attracting the child's attention, but quickly returns again as the momentary effort of fixation of the head ceases.

An almost constant association is nystagmus, and this is usually more marked in one eye than in the other, indeed, in some cases it appears to be limited to one eye. This nystagmus may be vertical, horizontal, or rotary; or even in different directions in the two eyes; it is very fine and much more rapid than the head movements. The nystagmus sometimes precedes by a few days the onset of the head movements, but perhaps more often it is first noticed a few days later. It can usually be increased, and is sometimes only elicited, by fixing the head which can be done by holding it between the hands, or by attracting the child to fix its gaze on some object.

Prognosis.—The condition, at first sight somewhat alarming, is a very harmless one; it seldom lasts more than a few months; its disappearance is very gradual, but, as a rule, is complete before the child is eighteen months old. Henoch mentions one case in which the movements were present at the age of three years, but specially notes that in this case dentition was still incomplete at that age. The nystagmus commonly lasts a little longer than the head movements. The affection seems to have no ill effect upon the child's general health either during the movements or after their cessation. In particular it may be noted that there is no resulting impairment of intellect, and we have seen no tendency to epilepsy in these children. In this connection we may also state that we have not observed the transitory attacks of unconsciousness which some writers have mentioned as occasionally happening during the persistence of the head-nodding.

One caution, however, may be given as to prognosis; very rarely a similar condition has dated from birth, and would seem to be persistent through life. To those cases we shall refer again; here it will be sufficient to note their occurrence as a point to be remembered.

Ætiology.—The causation of spasmus nutans is still a vexed question, but certain facts throw perhaps some light upon it. First, rickets is present to a greater or less degree in a large proportion of the cases, 9 out of 21 (Hadden), 33 out of 35 (Thomson). In our experience the degree of rickets has usually been slight, occasionally it is apparently absent altogether. An interesting point in this connection is the absence in most cases of those nervous phenomena which are specially related to rickets, such as tetany, laryngismus stridulus, and convulsions, but in one of our cases the "facial irritability," which is so often seen with the nervous phenomena of rickets, was well marked, and there was a history of attacks suggestive of laryngismus stridulus; in another case a convulsion occurred once during the persistence of the spasmus nutans; in another craniotabes, which often accompanies laryngismus stridulus, was very extensive.

Secondly, the onset and duration of the disease coincide roughly with those of dentition; moreover, the eruption of a troublesome tooth has in some cases been associated with an aggravation of the symptoms, which have again diminished after the tooth has come through.

So far the evidence would seem to point to a functional disturbance favoured by the nervous irritability of rickets, and excited by some peripheral cause such as dentition; but it must be admitted that either of these factors may be entirely lacking for this disorder has occurred at the age of six weeks, and sometimes rickets is absent altogether.

Other factors also have to be considered; we have seen spasmus nutans follow a few days after a fall on the head, and such a history is not infrequent; it has also followed some acute illness, whether one of the exanthems or some gastro-intestinal disorder: we have known it to follow directly after "congestion of the lungs."

Lastly, an interesting theory has been put forward by Raudnitz, and supported in a valuable paper * by Dr. J. Thomson, that the nystagmus is the result of eyestrain from living in a badly lighted room, and that the head movements are secondary to the nystagmus; the condition, in fact, would be closely allied to miner's nystagmus. Attractive as this theory is, it can hardly be considered "proven" as yet; in some of our cases the light conditions were apparently excellent. Morbid anatomy there is none: in two cases where death occurred from other causes during this affection, no change, macroscopic or microscopic, was found (Raudnitz).

Treatment.—It may be doubted whether the condition is much affected by drugs. We have used bromides, and sometimes the movements have seemed less therewith; but they continued nevertheless. Phenazone has produced little or no improvement. If rachitis is present, treatment should be directed accordingly, the diet must be revised, and cod-liver oil should be given.

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* "Internat. Contrib. to Med. Lit.," *Festschrift*, May 1900.

There are other rare conditions which may simulate the nodding spasm of infants. A congenital and permanent condition, closely resembling spasmus nutans, has occasionally been observed, and in some cases has been hereditary. The following case was recently under our care :

Harry F., aged seven years. Ever since birth nystagmus has been present together with unsteadiness of the head. Occasionally a series of rhythmical rotary movements of the head occur, resembling those of spasmus nutans, but the nystagmus is coarser and less rapid than in that affection. The fundus oculi appears to be normal, intelligence is good, but the boy has always had nocturnal enuresis and occasionally has passed his fæces in bed or in his knickerbockers.

Henoch records two somewhat similar cases in boys of nine and twelve years old : one a deaf mute after meningitis, the other having some disturbance of speech, but in these the date of onset of the symptoms is not mentioned. Idiots and imbeciles not infrequently show irregular and sometimes more or less ryhthmical movements of the head, which may be distinguished from spasmus nutans by the later age at which they are seen, and often by their less rhythmical and more voluntary character ; but it must be mentioned here that true spasmus nutans has been observed in Mongol imbeciles in infancy. The head movements in idiots are also more likely to be associated with swaying or other "automatic" movements of the body, a common occurrence in idiots.

A to-and-fro swaying of the trunk and head (eclampsia nutans) has been observed very rarely as a manifestation of epilepsy ; its nature may be recognised from the presence of other epileptic manifestations and its paroxysmal character.

Curious rhythmical movements of the whole body above the hips, either in the form of an antero-posterior or a lateral swaying, are sometimes seen in children who show no evidence of disease ; the movements are rather of the nature of habit than of a morbid spasm, and we are inclined to think that they usually occur in children of nervous temperament, and to that extent they have some practical significance.

It is important to remember that a rocking of the trunk to and fro as the child sits on a chair may be evidence of masturbation; in these cases the child usually flushes and perspires at the time, and as the flush passes off looks unusually pale.

Head rolling from side to side, which occurs sometimes at intervals of days or weeks, lasting perhaps half a minute or more at a time, and then ceasing for a few seconds, only to recur again with monotonous regularity, is not very rare in infants; in some cases its occurrence during dentition, or just before the appearance of a discharge from the ears, suggests that the exciting cause may be some peripheral irritation.

Probably closely related in ætiology to this rolling of the head, is the banging the head either into the pillow, or against or with some harder object; this again is sometimes more or less rhythmical in its occurrence, and appears to be due in some cases to the irritation of teething. It must be distinguished from the banging of the head, which is sometimes seen as an outburst of passion, in some of those children whose lack of self-control brings them under the category of so-called "moral insanity."

Nystagmus (oscillation of the eyeballs), when not a symptom of spasmus nutans or of the congenital nodding described above, may be a part of Friedreich's disease or of the congenital ataxia mentioned in the last chapter. It is also seen with cerebellar tumour, and as an occasional symptom both of hydrocephalus and of meningitis; it occurs also in various forms of idiocy, although probably in many of these it is due to defective vision.

We have seen a unilateral nystagmus in infancy without apparent cause; its complete disappearance before the end of infancy lends some support to the view that such cases are, if one may so say, cases of spasmus nutans without any nodding: and it is noteworthy that, apart from these cases, a unilateral nystagmus is practically unknown except in spasmus nutans; in all the other conditions mentioned here the nystagmus is bilateral.

Apart from these conditions, nystagmus is usually associated with amaurosis, or defective sight. Of six cases, four were blind; it is usually met with in infants a few weeks or months old, and is liable to be associated with blindness of any form.

Thus it is found with cataract, as well as with congenital defects of the fundus oculi. The nature of this muscular anomaly is obscure, but the fact that many cases occur when blindness has prevented the acquirement of the power of fixation seems to suggest that the faulty movement, if sometimes due to a central lesion, may at others be the result of the want of training which the ocular muscles suffer when imperfect vision is congenital or dates from very early infancy. The lens and the fundus oculi should be carefully examined for local disease. The presence either of cataract, or possibly some local distribution of retinitis or choroiditis, might allow us to hold out some hopes of relief by operation; for probably it can be said of this as of other muscular aberrations, that, no matter what the primary disease may be, some improvement may be expected by allowing education of the muscles to come into play.

CHAPTER XLV.

CERVICAL OPISTHOTONOS—STRABISMUS—TORTICOLLIS—LATERAL CURVATURE.

Cervical Opisthotonos is a symptom only, but it is of such importance as to demand a paragraph to itself. As we have already mentioned (p. 506) it is the prominent symptom of simple posterior basic meningitis, and in this disease may be so extreme that the occiput almost touches the buttocks. It is seldom present except in very slight degree in other forms of meningitis. Retraction of the head is sometimes associated with the irritation of teething, and in other cases may be the result of ear disease, perhaps even without external discharge, a point of some practical importance, as it suggests the need for a careful examination of the ears, and possibly in some cases for incision of the membrana tympani. We have also known head retraction to be the earliest symptom of cervical caries.

The case must be gone into completely, as sometimes the opisthotonos has appeared to be, like torticollis, either of rheumatic origin, or due to some temporary gastric disturbance. Strabismus, nystagmus and cervical opisthotonos, each and all, are worthy of investigation, from the interest which attaches to them with respect to the observations of recent years as regards the localisation of cerebral function. Ferrier has shown that retraction of the head is associated with destruction of the posterior part of the middle lobe of the cerebellum, and that disturbed movements of the eyeballs are found with other cerebellar lesions. It seems, therefore, not at all unlikely that what has been shown to be true for retraction of the head, both experimentally and clinically, may also be true sometimes for nystagmus and some forms of squint, and that a case may occasionally find its explanation in some bygone basal meningitis.

Strabismus may be mentioned here as an affection which is often of spasmodic origin. Internal strabismus is the common form of squint. It may be either concomitant or paralytic; the former is due to excessive development or excessive use of the internal, the latter to paralysis of the external, recti. Concomitant squint is much the more common, and is mostly due to hypermetropia. My colleague, Dr. Brailey, tells me that some error in refraction is present in at least 70 per cent. of all cases, although in perhaps a third of this number the hypermetropia is so low that it would be difficult to accept it as the real cause of the squint. But by this prevalence of hypermetropia sufficient to produce it, a difficulty is introduced, because the squint is frequently stated to have followed upon a convulsion. A history of this kind must be received with great caution, nevertheless it is probably true for some cases, and one can then only suppose that the central disturbance has upset a muscular balance, hitherto only maintained with difficulty, and which, once disturbed, is unable to recover itself. Of such cases as are not due to hypermetropia, some are thought to be dependent upon some congenital want of balance in the ocular muscles; others upon some defect in vision; others, perhaps, upon defect in the centres for the movements of the eyeballs, either of congenital origin or arising out of the disturbance of acute meningitis, and so forth. **Paralytic** squint is most often a symptom of tubercular meningitis; occasionally, perhaps, one of the results of a bygone basal meningitis. The **treatment** of squint belongs to ophthalmic surgery.

Torticollis, or stiff neck, might perhaps be made the text for dwelling upon the question of the existence of muscular spasm from local causes. But, of late years, such a group of cases has been by common consent much reduced by enlarging the area of central or nerve spasm. Wry-neck, however, does seem still to remain more local or functional than central, although, in ignorance of its cause perhaps it may be introduced here, as related, I think, to occasional cases of retracted neck.

Torticollis is a frequent affection of childhood, and may be said to represent the lumbago of adults; it occurs in rheumatic families, in children who are anæmic and out of sorts; it may also be a manifestation of acute rheumatism, we have seen severe endocarditis associated with rheumatic nodules, in a child who had shown no other evidence of rheumatism but stiff neck; it may also occur as a result of reflex irritation from enlarged glands, decayed teeth, &c. In these acute cases it is a somewhat painful affection, is associated with a good deal of malaise, and generally lasts three or four days.

This acute torticollis is a disease of childhood, not of infancy, and cannot, therefore, be easily confounded with the spasms and contraction due to the **sterno-mastoid tumour** sometimes found within a short time of birth, and supposed by many to be the result of injury to the neck in delivery (*vide* p. 22).

Congenital torticollis is not very rare, and is found sometimes where there is no evidence whatever of injury at birth. The causation in these cases is as obscure as in those which occur in later childhood, usually in girls in whom torticollis appears more or less insidiously and continues for months or years. In the congenital cases there is usually well-marked facial hemiatrophy.

Treatment.—Any local cause may be looked for, and, if possible, remedied. If none can be found it is advisable to give some gentle laxative and saline, such as the effervescing citrate of magnesia, or some such mild aperient, half a drachm to a drachm three or four times a day, and after a day or two to give Easton or Parrish or a like tonic.

In congenital and long-standing cases the question of operation by division of one or both heads of the sterno-mastoid must be considered.

Lateral Curvature of the Spine.—This disease is now generally relegated to the specialist and the surgeon, and perhaps advisedly so: certainly its treatment requires both time and care. But inasmuch as many of the cases—girls chiefly, quite seldom boys—are seen in the early stages by physicians and general practitioners, who have then to advise upon their treatment, a short note of the condition may well be given here.

And we may commence by saying that, while a bad lateral curve is a thing to be carefully guarded against, we are of opinion that a great deal too much apprehension is often felt on account of slight irregularities of the spinal column. Dressmakers are often responsible in this matter; a little difference in the level of the two shoulders, and they pull a long face, and off goes the mother to the doctor with the idea of spinal disease in her head. There is no discrimination between disease of the bones and a mere weakness of the muscles, a thing in itself of very little significance, although it is an important signal of general debility, which may require some care to control or eradicate.

Lateral curvature of the spine usually occurs in the pale, flabby, overgrown girl who has little nervous energy: it is seldom seen, in severe degree, in the bright, happy-go-lucky, sparkling child; and it is important to bear this in mind when attempting to forecast the future of the curvature, for the cases separate themselves to some degree into two groups: cases which any one can cure, and these, we think, are chiefly seen in those who may be called otherwise healthy children; and those, again, which no one can cure, these being emphatically in the lethargic and pasty. The opprobrium of these is too often evaded by saying that they come under treatment too late. But we very much doubt if this is really so; "too late" seems to come so early in the malady. We would rather hold that, notwithstanding all the controversy that has centred round spinal curvature of this type, and its treatment by exercises or mechanical support the last word has not yet been said, and that mere muscular weakness and consequent rotation of the spine, and subsequent permanent distortion, do not explain the persistency that many of these cases exhibit. We think it probable that now that the X-rays have come to show us what the exact condition of the bones is, we may be able to do more for these cases in the future than we have done in the past.

Symptoms.—These are often very vague. As we have said, the dressmaker sometimes makes the diagnosis. But it may be that the child walks in a crooked way, one shoulder is noticed to be higher than the other; or the projection of the lower angle of the scapula raises fears that "the shoulder is growing out"; or a greater prominence of the iliac crest on one side suggests that there is "a growing out" of the hip; and in general the child is listless and wanting in carriage. Then the mother, more alert about the child's figure than about many a more serious matter of health, takes her, very rightly, to the doctor.

Treatment.—As regards treatment, the first thing to be accomplished is to see that everything in the daily life conduces to a healthy tone of mind and body. The child should have good food, and be made to eat it slowly, and be trained into the habit of perfect mastication; bed- and sitting-room must be well ventilated, and great attention is to be paid to the position of the child in her various studies; desks and chairs specially adapted to this purpose are now in general use. Faulty habits must be watched for and counteracted; and of common ones that may be mentioned, standing on one leg, sitting cross-legged, the twist that too often obtains in violin-playing, these may require some little ingenuity to correct. These children should not be kept for long stretches in the school-room, they must have plenty of fresh air and healthy, invigorating games. Riding both sides of the saddle, cycling, hockey, cricket, and rowing, if possible; indeed, any out-door games are of value in the treatment of these cases.

The doctor should examine the child from time to time to see that nothing more is needed. Where such means are not sufficient, or where the curve is so pronounced that it is not wise to trust to these alone, Swedish exercises and other forms of drill may be resorted to; these, combined with massage, are often successful, and if they fail, the more elaborate exercises, carried out under the direction of the surgeon, must be adopted.

Of the two methods, that of muscular exercise, and that of mechanical support, the former seems to us by far the most physiological, for the spine is an exceedingly difficult column to pin within a mechanical support, and there can be no doubt that many such are a delusion and a snare. But any one who has seen much of lateral curvature will be ready to admit that there are some cases so intractable that even this method is by no means always valueless. As a rule, however, regular exercises practised over a period of some months, and carefully devised for the individual case, will do much to rectify the deviation, and if there be any permanent change in the bones, prevent the curve from becoming worse. It is in the advanced cases that mechanical support is more especially of value, for there is no doubt that when the spine is past righting, persistent exercises sometimes increases the rotation, and while seeming to do good, really make matters worse.

We have spoken above of the common condition which is popularly known as a "weak spine": allied to this in ætiology is the lateral curvature which is seen in association with progressive muscular atrophy and Friedreich's disease; and as possibly related to this group in which muscular weakness is the determining factor, or to those next described, we may mention here the scoliosis which is occasionally seen in rickety children.

Other forms of lateral curvature are independent of muscular weakness, and are secondary to distortions of other parts of the skeleton—for example, the curvature due to old pulmonary disease or empyema; those due to hip disease or other conditions, with shortening of one leg, and the curvature associated with persistent torticollis.

In addition to these may be mentioned a rare congenital form,* in which the curvature has resulted from the intercalation of the lateral half of a supernumerary vertebra, or from the failure of development of one half of the body of one of the vertebræ.

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* *Journal of Anatomy and Physiol.*, vol. ix, 1875.

CHAPTER XLVI.

INFANTILE CONVULSIONS—EPILEPSY—NIGHT TERRORS.

Convulsions occur very early in infant life, and it is perhaps well to mention first such as attack infants of a few days or a few weeks old, because they are probably peculiar both in cause and progress. In infants a few days old they are often associated with unnatural drowsiness, and they very generally pass off in a few days. In infants of several weeks, they are liable to come on suddenly; to occur one after another in quick succession, and to be associated with pyrexia. It is said that attacks of this kind are mostly due to indigestion from the caseine of cows' milk; and a wet nurse is the proper remedy. I have seen several such that looked alarming do perfectly well by simple attention to diet, such as feeding on a cream mixture, and sometimes using a little bromide and now and then an inhalation of chloroform. But the more common age for convulsions is from seven or eight months old and upwards, and at this period we meet more particularly not only with severe and general convulsions, but many cases of local convulsive spasm or rigidity, such as strabismus, laryngismus, and that rigid inturning of the thumbs upon the palms and rigid flexion of the feet which have received the name of tetany, or contracture. There is no essential distinction between infantile convulsions and epilepsy, so far as the fit is concerned; the difference lies in the temporary character of the one and the chronicity or tendency to recurrence of the other. Nor will it do to push this difference too closely, for infantile convulsions may last, if not treated, for months. On looking over my notes, I find a tendency to class all convulsions under two years of age as "infantile," and all over that age as epilepsy, but in the epileptic cases are several in which the fits have continued since infancy. Perhaps this fact may have its instruction for us. The chronic tendency to convulsions which we call epilepsy, unquestionably has much of habit in it: each additional fit that comes makes the brain more prone to another, and it may well be that the convulsions of dentition, unchecked at their first onset, in some cases become a confirmed habit, and thus chronic or "epileptic." Eight out of twenty-six cases of epilepsy had suffered from infantile convulsions at an earlier date, and Sir W. Gowers, working with much larger numbers, still makes the proportion as high as 7 per cent. of all cases investigated, and he adds, it seems reasonable to ascribe to these convulsions of infancy a share in predisposing to the convulsions of later life. Neurotic heredity, according to the same observer, is found in 34 per cent., the same as for the whole of life.

The convulsions of dentition, no doubt in part influenced by hereditary tendencies, are yet, it is now generally admitted—following the observations of Sir William Jenner, and later of Dr. Gee—largely associated with rickets; and it is believed that the impaired nutrition of which rickets is the expression is productive of an irritable or unstable condition of brain causing it to discharge itself spontaneously, or on what would otherwise be an inadequate stimulus. A certain proportion of cases is due to actual brain disease. Of 102 cases recorded by Dr. Gee, one-fourth was due to local disease, and the remainder to general causes. These include various conditions, but only one of any numerical consequence apart from the rickets—viz., some acute exanthem. Reducing the number from these causes, fifty-six cases remain, and every one of them was rickety.

Convulsion, then, during dentition, if it be not due to the onset of an acute febrile disturbance—and even in such cases it is still possible that the same condition may sometimes be at work—is one of the modes of expression of rachitic mal-nutrition, and this is really the important factor in the causation of the disease. It is quite unnecessary to take up space by enumerating all the secondary conditions which in this state will induce a fit. I would say, with Dr. Gee, that the convulsive diathesis affords an opportunity to a thousand irritants, natural and unnatural. The reader can readily fill in for himself some of these numerous local factors—the dentition, the worms, the indigestible food, the excited play, the febrile state, and so on.

Dr. Eustace Smith* has recently emphasised the fact that in children beyond the age of infancy, sometimes as late as twelve years of age, a convulsive attack may occur, perhaps once, perhaps two or three times at longer or shorter intervals as the result of some reflex disturbance, particularly digestive disorder: and such attacks, although occurring in these older children, resemble the convulsions of infancy in their temporary character. As regards the character of the attacks in these cases, we doubt if any valid distinction can be drawn between them and epilepsy, but our own experience confirms the transitory nature of the attacks in many instances, and, as Dr. Eustace Smith points out, the effect of removing the source of irritation by suitable dieting, &c., seems to prove their reflex origin.

Symptoms.—These are not quite the same in infants as in older children and adults. Infants are said to turn pale, to turn up their eyes, to get black in the face, to catch their breath, to become livid about the lips. Sometimes even babies will scream violently or give a cry before becoming convulsed. Sometimes they lose consciousness only, and wake up with a start. Once I noted insensibility, with a clonic convulsion of head and upper part of chest; the chin on the sternum, and inspiration snoring. Laryngismus is common; sometimes there is tremor in sleep; sometimes the whole body becomes stiff, and the breathing impeded—a half-tetanic state; sometimes even in infants the character of the adult fit is maintained; there is the initial pallor, followed by lividity and convulsions—the fit commencing with a cry, and then succeeded by somnolence. Lastly, may be mentioned twitching of the lips, startings, half-closed and winking eyes. Contracture of fingers and hands—the *tétanie* of Trousseau—is also closely allied to convulsions, and is of importance as an indication of the convulsive diathesis (*vide* p. 612).

Diagnosis.—The first point must be to search carefully for indications of rachitis; their presence will tend to make one examine more critically the evidences of local disease which may present themselves. It will also be necessary, as far as possible, to assure ourselves of the absence of any acute exanthem. Very likely this will be impossible, for, in infants, pyrexia is quickly

* *Lancet*, January 24, 1903.

induced from numberless causes; and the local factor which produces the convulsion will be liable to provoke febrile disturbance also. If an exanthem can be excluded, then there are the various local conditions to be sought, chief of importance being brain disease, such as meningitis from disease of the ear, hydrocephalus, and so on. Excluding these, as we probably may do, in the absence of any evidence of cerebral disease save the convulsions—and, perhaps, a bulging fontanelle, to which I have already alluded, as having but little significance necessarily attaching to it—we next examine into the question of teething, food, state of bowels, &c.; and we shall by that time probably be in a position to form some idea of the cause of the convulsion in the case before us.

Results.—Hemiplegia may follow an attack of convulsions, as we have several times seen. It may be only of temporary duration; but should it not pass off, or should any rigidity come on, some local disease of the brain in all probability exists. Children sometimes stammer and are stupid after a fit. In several cases of idiocy the history of a fit is the first note of evil. Strabismus appears to be one of the common results of convulsions, the pre-existence of hypermetropia notwithstanding.

Lastly may be noted the curious and interesting observation of Mr. Hutchinson, that zonular cataract is a frequent associate of infantile convulsions and rickets. It may be congenital, therefore the accuracy of calling it a result may be questioned; but it may also form after birth, and it usually affects both eyes.

Prognosis.—Many children die from convulsions at this early period of life; and if frequent and violent they must necessarily constitute a serious danger. This will be more especially the case when dependent upon such conditions as the onset of scarlatina or measles, or the existence of whooping-cough. In the case of local disease of the brain, including, as it does, meningitis of all kinds, tubercle, tumours, chronic hydrocephalus, &c., the disease can hardly be increased in gravity by the onset of convulsions. But where it is associated with rickets, and the initial convulsions do not cause death, there is every hope that treatment will be successful in warding off their repetition.

It is an interesting question how far infantile convulsions may foreshadow a tendency to neuroses in later life. Dr. Coutts has laid some stress upon this sequence, and our own experience abundantly confirms it.

Treatment.—In the actual convulsion what can be done should be done to stop it. This is not much; but it is probable that the old-fashioned treatment, often called derivative, is of use, by lessening the turgid state of the brain which the fit produces, and which probably tends to prevent the restoration of equilibrium. To this end a warm or mustard bath is advisable, and an aperient should be given at once, or an emetic may be given first, and the aperient after it has acted. Calomel is easy to administer, and is effective, and a couple of grains may be given to a child of a year old. All this done, an ice-bag should be kept in contact with the head. When the child comes round, five grains of bromide of potassium may be given immediately in some syrup; or if there is much somnolence after the fit, ten grains in solution may be given by enema. If this is not successful, bromide of sodium may be substituted, or chloral combined with the bromide. As I have several times had occasion to remark, young children take both bromide and chloral well. Five grains of each may be given in combination to a child a few months old, if the case be urgent from the continuance of the convulsions. It is well to remember that the rectum is always available for these remedies, and that they act very well when administered in this fashion. If the convulsions be due to blood poisoning of any kind, it is better to wait till they have subsided, to see what course the case threatens to take. It need not necessarily be of greater severity because it has commenced so. Should it threaten badly, quinine should be given at once. If the convulsions follow quickly one after another, an inhalation of chloroform is the best remedy.

Tetany is a condition which is far commoner in infancy than at any other period of life, but it is seen not uncommonly in older children, and occasionally in adults.

In London, at any rate, it has a seasonal variation, and occurs with most frequency in the spring. In infants and young children it occurs more often in boys than in girls, but in later life this proportion does not hold good.

Ætiology.—With regard to the causation of tetany very little is known, except that during the first two or three years of life it is almost always associated with rickets, and therefore usually with a convulsive diathesis, but some other factor is probably present, at any rate, in most cases. The remarkable frequency with which some gastro-intestinal disturbance precedes tetany suggests very strongly some causal relation, and if one had to propound a theory one would say that absorption of some toxin from the gastro-intestinal tract is at least a possible source of the condition, and this view would be supported by the occurrence of tetany after washing out the stomach in adults and also by the common occurrence of slight albuminuria, a frequent result of gastro-intestinal disturbance, in the tetany of infants.

Dr. John Thomson has pointed out that tetany occurs particularly when cold winds are blowing, and it is possible that in some cases cold is an exciting cause.

Tetany is also met with in children past babyhood. Dr. Moxon described a case in some respects well marked in a boy of three and a half years, in the *Guy's Hospital Reports* for 1869-70. It was to him then a rarity, but I imagine that all who see much of the diseases of children are sufficiently familiar with it. In Dr. Moxon's case the disease affected the hands and forearms, and it much resembled the tetany of babies, but, as I have seen it, it has more often attacked the calves of the legs and the feet, and the cramp thus produced is an exceedingly painful affection.

It occurs in boys and girls mostly of seven to ten years of age—spare, neurotic children who have been difficult to manage, or have been neglected or spoilt as regards their diet. They are put under treatment for " the cramp," and the affected muscles if caught in the spasm are hard and very sensitive to handling. If the hands are affected the forearm may be bent; it is usually pronated, and the hand also a little flexed, and the thumbs are inturned and the fingers stiffened. In the lower limbs the feet are arched, but the distortion is less marked; the hardened calf is the more characteristic feature.

Symptoms.—The characteristic feature of tetany is the position of the limbs. The hands are slightly flexed at the wrist, and are kept pronated, the thumb is rigidly drawn into the palm of the hand, so that the top of the thumb rests usually between the ring and middle fingers; the fingers are semiflexed at the metacarpo-phalangeal joints, and all the phalangeal joints are extended. The fingers are crowded together so that the hand is more or less cone shaped. The elbow is usually flexed, the legs are extended, and in most cases the ankle also is extended, so that the toes are pointed. The toes like the fingers are crowded together, and semiflexed at the metatarso-phalangeal joints, so that a deep longitudinal crease is produced at the anterior part of the sole of the foot. The onset is often quite insidious, but it sometimes comes on suddenly with cramp-like pain which may be so severe as to make the child cry out. In the majority of cases there appears to be little or no pain ; the child is quite happy, even playing with its toys, in spite of the difficulty in handling them. The spasm may be intermittent, lasting on and off for a few days, or it may be continuous for a week or more.

Two conditions are so commonly associated with tetany, that its description would not be complete without mentioning them, namely, laryngismus stridulus and facial irritability. This latter is demonstrated by tapping gently over the facial nerve, each tap produces a twitch of the corresponding facial muscles ; this irritability is not, however, limited to the facial nerve, similar contraction of muscles may be produced by tapping over the motor nerves where they are most superficial in the arm or leg. The tetany position, as Trousseau pointed out, can often be reproduced after it has disappeared, by firmly constricting the arm or leg in the grasp of the hand for half a minute or a little longer. In this way as the result of pressure on the nerves or vessels—it is uncertain which—the typical tetany position may be reproduced in some cases for weeks after spontaneous tetany has disappeared. This artificial reproduction is sometimes of value in diagnosis.

It is by no means rare to find slight albuminuria in cases of tetany. Œdema also of the hands and feet is present in some cases, but not very commonly in our experience.

Electrical excitability is increased, and there are sometimes qualitative alterations of reaction to galvanism, the reaction to anodal opening and closing current particularly being increased.

Pathology.—In the cases of tetany which we have examined post-mortem no lesion has been found to account for the condition. It seems probable that tetany is due to some disturbance of the central nervous system, but even this is uncertain. Some have maintained that it is a peripheral disorder, and the possibility of reproducing the spasm by constricting the limbs might seem to support this idea.

Prognosis.—Tetany is rarely a serious condition. Cases have been recorded where it proved fatal by affection of the respiratory muscles; but in the majority of cases the child's general health is scarcely affected—except in so far as there is some preceding condition, such as rickets or gastro-enteritis—and the tetany is quite a mild disorder which passes off in a few days, or at most in a week or two. General convulsions are a not very rare complication of tetany and of course make the prognosis more doubtful, and it must always be remembered that tetany is often associated with laryngismus stridulus, an affection which we have several times known to prove suddenly fatal in cases where the tetany had given rise to no alarm.

Treatment.—The actual spasm but seldom calls for treatment with any urgency, but if there is pain, bromides, chloral, or opium are worth a trial though by no means certain in their result. Treatment must rather be directed to the underlying conditions, any gastro-intestinal disturbance particularly must be dealt with, and the nervous instability which is a manifestation of the rachitic element is often lessened by cold or tepid douching, while of drugs cod-liver oil and iron are the most useful. In the cramp-like spasm of older children gentle rubbing may relieve the actual attack and bromide of potassium may help to allay it. Saline aperients should be given and arsenic with nux vomica may be useful in preventing a recurrence; the general hygiene, particularly the diet, will probably require supervision.

Epilepsy.—From the tables published by Sir William Gowers some very important facts are learnt concerning the disease as met with in children. Out of 1450 cases, 12½ per cent. commenced during the first three years of life; 5½ per cent. of the whole occurred in the first year; from then to five years the numbers fall, till at five the minimum for the early period of life occurs, only 1.7 per cent. beginning at that time. At seven, the commencement of the second dentition, the numbers rise again, then fall, and rise again, until at fifteen or sixteen the maximum for this period of life is attained with 5¾ per cent. of the total numbers. Of those cases which first occurred before the age of three years, ascarides, sunstroke, falls, injuries at birth, are given as causes in a few cases; but the far larger proportion occurred before the first dentition, and were attributed to teething; and the total number of cases so caused may be put at 7 per cent. of the whole. If we further allow, as we can hardly escape doing, that rickets plays a large part in the occurrence of convulsions, and add other cases to those given in which it was probably present in early life, although the convulsions did not occur till later, we have rickets playing the part of a predisposing cause in 10 per cent. of the whole number. The neurotic heredity was in great measure transmitted from actual epilepsy (three-fourths of the inherited cases); but insanity was combined with it in a considerable number. Of other diseases, chorea existed in other members of the family in numbers not far short of those of cases of insanity.

Epilepsy is sometimes associated with malformation of the brain, sometimes it comes on after hemiplegia, or blows, or a fall upon the head.

Symptoms.—The chief feature of epilepsy is loss of consciousness, and this takes place in very varying degrees. Children will sometimes have a violent convulsion, with bitten tongue, and insensibility, succeeded by stupor, as is so commonly seen in adults; but a large number only faint or lose consciousness for an instant, and no more, but with a recurrence many times in the twenty-four hours. There is a sudden pallor, perhaps a momentary drop of the head, while anything in the hands falls as from one momentarily overcome by sleep. The fits in children have a special tendency to occur by night. The nocturnal fits may consist of mere tremors, or the child may appear to awake, but with fixed gaze. It is perhaps convulsed, or laughs and talks in an idiotic manner. Observations as regards an aura are perhaps hardly reliable; but I have several times elicited descriptions of giddiness and of disturbed sensations in the arm or in the fingers, and once in a girl of nine the fit regularly began by a complaint of abdominal pain.

Diagnosis.—The paragraph dealing with the diagnosis of infantile convulsions may be referred to.

Hysteria is rare in children, and must be diagnosed with caution. A girl aged nine years was brought to us for "fits";

more than fifty had occurred in the week. During examination a "fit" occurred, the child fell on the floor and dashed herself about and attempted to bite any one who came near. There could be little doubt of the hysterical nature of the attack. In another girl aged eleven years the "fits" were preceded by a "globus hystericus."

Prognosis.—This is neither better nor worse than it is in adults. A great many children improve under proper treatment, and the frequent recurrence of the fits is kept in abeyance. As already mentioned (p. 610), some epileptiform attacks in children seem to be due entirely to reflex disturbance, and on the removal of the source of irritation may never occur again. When the fits are of recent origin, or have occurred but seldom, there is always a hope, to be encouraged in every possible way, that they may never recur; but, as in adults, there are also some very obstinate cases which resist all treatment. Some of the worst cases I have seen in this respect have been associated with confirmed hemiplegia, late rigidity, and so forth. If the fits are very frequent and intractable, there is a fear of imbecility following after.

Treatment consists of attention to the child's hygienic condition—in seeing that the food is of proper quality, that the bowels are regular, and sleep good. For the arrest of the convulsions, bromide of potassium is the most generally useful remedy. It may be given without risk (save with one exception) to the youngest children. At a year old we may begin at five grains three times a day, and even increase the dose if necessary. For older children of ten and twelve: ten, fifteen, or twenty grains may be given three times a day. If this should not be successful, very likely the bromide of sodium will be so. I have sometimes thought that the latter is more useful with children than the former. In some cases the iodide, combined with the bromide is successful. Bromide and digitalis, or bromide and belladonna, are good combinations when a neurotic heart is associated with the fits. Oxide of zinc is a good remedy for children, in three- or five-grain doses; borax is recommended by Sir William Gowers, and in doses of five to ten grains for a child of four years and upwards it has seemed to us to cause distinct improvement in some cases.

A child that has had convulsions will require careful watching at particular periods. The figures already quoted from Gowers show that both the second dentition and also puberty are times at which the disease is likely to show itself. Therefore, the bromide should be resorted to if any threatenings occur. Mental study should never be allowed to proceed to the extent of exhaustion. Exercise should be abundant, and food nutritious; while all things that make for a too continuous or excessive, and therefore morbid, nervous erethism, must be avoided or controlled.

The one risk attaching to the administration of the bromide is its liability to produce an acneiform eruption or warty granuloma-like swelling over the body. The risk of this may be considerably lessened by combining some liq. arsenicalis or liq. sod. arseniatis with it—a drug which is very readily borne by children: and the bromide should never be continued with young children for long periods continuously. Recently a compound of bromine with sesame oil has been introduced under the name of bromipin or brominol, and this preparation is said to be less liable to produce skin eruption than the ordinary bromides. We have used it for rectal administration, and have thought that it may be a useful alternative where there is any special susceptibility to the cutaneous effects of bromide; half a drachm or a drachm of bromipin may be injected into the rectum twice daily.

Nightmare, or **Night-Terrors** (*Pavor nocturnus*), is a nervous affection of young children, and is allied to the much rarer phenomenon of sleep-walking. It is also akin, I doubt not, to one form of nocturnal incontinence. All these conditions may be described as sleep disorders where cerebral undercurrents seethe below a placid surface. Nightmare is usually supposed to have much to do with dyspepsia. Henoch, however, will not allow that food has anything to do with it, and I agree with him for the most part. The children in whom it occurs are usually quick, excitable, nervous children, and it runs in rheumatic and neurotic families, and in these all sorts of little peripheral disturbances will excite the neurotic manifestation, and thus various gastro-intestinal disturbances may determine the explosion. Occasionally the obstruction to respiration caused by enlarged tonsils and adenoids may be responsible. It would be interesting to follow it up in relation to epilepsy and other nervous disorders; but happily one can say of the large majority of children who suffer in this way that they certainly do not develop any serious form of neurosis in later years. Of thirty-seven cases, there were twenty-one boys and sixteen girls, and nineteen of these had a family history of rheumatism; some others came of a nervous or neuralgic stock.

The following is a fairly typical case:

A thin, delicate, nervous boy, aged four and a half years, whose mother suffered from hysteria, was brought to us for night-terrors. Each night, about one hour after going to bed, he seems to wake and screams, sometimes as if in terror, sometimes apparently without cause. This continues for about twenty minutes in spite of efforts to soothe him, and then he goes to sleep again. He has no remembrance of the attack next morning.

In some cases there are definite hallucinations, the child fancies he sees some strange man or some animal which terrifies him: he starts up in bed, or even gets out of bed, and screams or talks incoherently of what he sees. The child is not properly awake, and often does not recognise his nurse or mother when they try to quiet him.

It is to be treated with a few doses of bromide of potassium, or that and syrup of chloral, and in this way always subsides. Any exciting cause, whether it be the presence of worms, errors in diet, or the like, must be sought for and removed. It is a malady of little detriment in itself; but as an indication of a nervous organisation, it is most valuable. It is not very uncommon to obtain a history of night-terrors at the onset of chorea, and it is possible that in some cases these attacks may be the exciting cause of the chorea. It is the "slacken speed" to the engine-driver which must never pass unheeded. It is one of the smaller ailments I am always most careful to inquire for and to treat, for it is my belief that by so doing it may be possible to avert some one or other of the graver nervous maladies so common in later life.

Pavor diurnus, so called, by Henoch, is a similar, but much more uncommon, ailment, and consists of sudden attacks of fits of terror by day. The child so affected will suddenly go off without obvious reason into a violent screaming fit, and nothing will pacify it. At the same time, it may show a definite dread of perhaps its nurse or mother, of whom in times of health it is even inordinately fond. It will often at such times show other evidences of mental instability, and we have even known the child to be quite maniacal. The following case may be quoted as a typical example of this affection.*

A boy, about six and a half years old, about four years ago had night-terrors, which continued to occur, but with decreasing frequency until seven months ago when they ceased. Three months ago he awoke one night at 11 P.M., and although he was wide awake he seemed terrified, clutched at his mother, and said he was afraid of the trains (which run near the house, but of which he had never shown the least fear before). Similar attacks occurred on several nights subsequently, about the same time, the child being wide awake on each occasion.

Two months ago, after having one of these attacks on the previous night, he began screaming in fright one morning at 8, but without knowing why, and during that day he had several similar attacks. After this he had many attacks both day and night. They occurred at any time of day. Often the boy would suddenly stop in the middle of his play, look terrified, and rush to his mother screaming. Sometimes he says he hears something which frightens him ; sometimes he hears an imaginary person coming up the stairs, whom, however, he is unable to describe ; and sometimes he cannot explain why he is frightened. During these attacks he always seems to recognise people about him, and there are no visual hallucinations. His face does not change colour during the attack. The whole duration of the terror is not more than half a minute. He is spare, with bright intelligent face, very quick of apprehension, talks in an eager, excited way about his toys and games, and is obviously a child of very nervous temperament. He is pale, and the mother says he has been getting thinner ever since the attacks began three months ago. As an infant he never had convulsions, and beyond measles and the night-terrors mentioned above he has had no other illness. He complained of headache once three months ago, but not since. The family history showed acute rheumatism in the mother and the maternal grandmother, but no fits or neuroses of any kind.

This condition usually passes off after a little while, leaving no ill-effects behind. We have generally given bromides, the good effect of which is almost immediate, but undoubtedly the occurrence of these day-terrors is sometimes closely associated with some gastro-intestinal disturbance, it may be some chronic catarrhal condition, such as Dr. Eustace Smith has described under the name of " mucous disease," or it may be simple constipation; any such cause of irritation must be removed by careful dieting and other suitable treatment.

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* "Day-Terrors in Children," *Lancet*, Feb. 1900.

Somnambulism.—Sleep-walking is a common occurrence in children of nervous temperament. The child who suffers frequently with headaches, who has night-terrors occasionally, who is easily excited and worries over his lessons, is the child who suffers from somnambulism. And we use the word " suffers " advisedly, for to some of these sensitive, nervous children the dread of sleep-walking is a nightly dread which haunts the child's imagination. Nor is this condition without its actual dangers. We have more than once known serious accidents to occur to children whilst walking in their sleep. In some cases certainly it is related to school pressure; school examinations seemed responsible for it in one girl under our own observation, and any such mental strain is to be carefully avoided for such children.

As a rule, somnambulism is easily checked by the administration of bromides; but any exciting cause, whether it be some gastro-intestinal disturbance, as would appear in some cases, or some source of mental worry, must be removed.

CHAPTER XLVII.

FUNCTIONAL NERVOUS DISORDERS—HEADACHE.

Hysteria is quite uncommon in childhood, but it is sufficiently frequent to make it very important always to remember the possibility of its occurrence. We have seen severe hysterical symptoms at the age of four and a half years, and hysterical analgesia has been recorded at the age of two years and nine months (Barlow). The majority, however, of the cases which are seen in childhood occur in children over the age of eight years. Out of thirty-six cases which came under our observation in children up to the age of twelve years, twenty-six were eight years old or more. In one respect hysteria at this age differs from hysteria in the adult; it affects boys almost as frequently as girls; of our thirty-six cases fourteen were boys, twenty-two were girls.

Amongst these functional disturbances have been functional vomiting and an extreme case of functional hiccough, each in girls about twelve years; and moderate hystero-epilepsy in girls of ten and twelve. In another girl of twelve there was functional paralysis of the abductors of the vocal cords. She had a fit in the out-patient room, and became insensible and rigid, but was not convulsed. She had also a croupy cough; but on examining the larynx, which she very readily suffered, there was an entire absence of any morbid appearance, except in the position of the vocal cords. These played about somewhat close together during expiration, and during inspiration the anterior parts completely closed, the left overlapping the right, and leaving only a chink posteriorly for the entrance of air to the lungs. The paresis of the abductors was clear, and the functional character of the malady was equally so, for it quickly improved, so that in the course of half an hour it had almost disappeared. This patient had been in the hospital under Dr. Taylor for cataleptic attacks, and, in one of her fits, her eyes were first turned strongly to one side, and then she squinted. Indeed, to say that the child was the sport of nerve storms very aptly describes her case.

Twice I have seen hemi-anæsthesia with hemiplegia in boys of eleven or twelve. In the case under my own care, I was at first disposed to think that there might be some actual lesion, notwithstanding the strong probability which experience teaches that, with complete hemi-anæsthesia and hemiplegia, the condition is a functional disturbance only. But we subsequently learnt that the child was a regular vagabond, and his previous history, his habits, and the variability of the paralysis, made the case conform to rule.

The boy was twelve years old, with a neurotic family history. The paralysis came on in a night, four months ago. He had been a sharp boy, and had reached the highest class in the school; but he had become dull and odd in manner, staying out all night, and being dirty in his habits.

He had a markedly neurotic aspect--very dark, with deep-set eyes and a small cranial development. He had a cunning appearance, yet had no air of imposture about him. His face was paralysed on the right side, and the tongue deviated to the right. The right arm was paralysed, the extensors of the forearm most markedly so, and the wrist dropped as in lead-poisoning. He made evident effort to move it when told, but was obliged to call in the aid of the opposite hand. There was less decided failure in the leg, but when he walked his toes caught the ground in putting the foot forward—the knee was flexed, the heel drawn up, and the limb moved clumsily, as from want of harmony between the co-acting muscles rather than from actual paralysis, but the extensors obviously were the weaker. The loss of sensation was complete, and thoroughly distributed to the right half of the body, mucous membrane as well as skin. The knee reflex on the paralysed side was markedly exaggerated, and those of the skin were absent. He was partially undressed for examination, and as I watched him in attempting to re-dress whilst we went to the other children in the ward, he was evidently quite helpless as regards the right arm. The paralysis both of sensation and motion—but the former far more than the latter—varied much from day to day; and sometimes his special senses suffered, and he would become completely deaf on the right side, unable to smell with the right nostril, and wholly blind with the right eye. He could not then tell the light from darkness, nor did he flinch when the finger was brought close to his eye. There were no morbid ophthalmoscopic appearances. Unfortunately he became so unruly and dirty that it was necessary to discharge him, and he was thus lost sight of, not much better than when he was admitted.

Hysterical contracture will also be found sometimes in girls of eleven or twelve. Quite lately, a case of this kind has been under my care. It was speedily cured by keeping the sound arm firmly bound to the side, and compelling the use of the other.

Hysteria in children as in adults may closely simulate organic disease; we have seen talipes, spinal paraplegia, spinal caries and rheumatism all simulated by hysteria in children under twelve years of age. But one must approach the diagnosis of hysteria in childhood with the utmost wariness. Hysteria is rare in children, and it is an ugly error thus to mistake a case of organic disease.

Habit Spasm: Tic Convulsif.—Curious jerking movements, evidently functional in origin, are very common in the later period of childhood. It mostly happens that the child is supposed to be threatened with chorea, but the condition is a quite distinct one, and commonly shows itself by blinking of the eyes, various grimaces from contortion of one or other of the muscles of the face. In many cases it will be found that the head is jerked in a particular way.

The following may serve as a typical instance:

Frank R., aged eleven and three-quarter years; brought to the Children's Hospital, Great Ormond Street, for a sudden blinking movement of the eyelids, and a frequent twitching of the left angle of the mouth. These movements had been noticed for six months, and had varied in degree from time to time.

He is a pale boy with a nervous manner; wears spectacles, and is much fonder of books than of games. He is very forward in his school-work, talks much in his sleep, and is very faddy over his meals. The spasm mentioned is very noticeable; when first seen it was thought the arms were slightly restless, but this was not noted afterwards. He has never had definite rheumatism, but has had some vague pains in the joints. Two of his brothers had rheumatism, his sister had chorea, and his father had probably had rheumatism.

This case illustrates the association of habit spasm with a family history of rheumatism, a feature we have often noticed, and one which no doubt is a manifestation of the close connection between rheumatism and the nervous temperament. This association is of some importance in diagnosis, for it is by no means always easy to distinguish between these habit spasms and a slight chorea, and it is to be remembered that the presence of rheumatism in the family, or even in the child, is quite compatible with either condition.

The points which would suggest habit spasm are: the very localised character of the movements, which are often limited, for example, to the eyelids, the nose, or one shoulder; the special tendency to affection of the facial muscles only, the repetition of one particular movement or set of movements in the part affected, unlike the irregular and ever varying grimaces and movements of chorea; and, lastly, in some cases, the lengthy duration, running on sometimes to years, albeit with fluctuations.

Drug treatment in these cases, however, is often unsatisfactory, and it is well to inform the parents at once that if any good is to be done, patience and perseverance will be necessary. Perhaps arsenic is the most generally useful drug; sometimes it seems more effectual in combination with bromides. Often the general tone of the child is poor, and nux vomica and iron may, as happened in the boy mentioned above, produce a speedy improvement. A change from town-life to country, and a month or two of running wild at a farm or at the seaside, may be more successful than any amount of medicine.

Whilst these movements are correctly described as functional, it is important to remember that many of them have an organic basis in some local inflammation or other irritating lesion; for example, the very common form, which consists of frequent blinking of the eyelids, is excited in many cases by a follicular conjunctivitis which may be so slight as to have escaped notice, and in others by some error of refraction: again, we have seen a frequent twitching of the nose in a child, apparently started by an inflamed condition of the mucous membrane over the septum nasi.

But for the majority of the cases no such explanation can be found, and indeed some of the movements are so curious that it is difficult to imagine how they can have arisen.

We remember one little girl about seven years old, who accompanied her words with a rhythmic swaying to and fro of the trunk, at the same time thumping her right knee with her clenched fist. This continued some weeks, but subsided on the administration of some particularly disagreeable medicine. Many other such movements occur; it may be a repeated sniff or a frequent grunting noise. One child, a girl aged eleven years, was brought to us for flatulent belching which occurred at intervals of about thirty seconds, and was followed by a gurgling sound apparently in the œsophagus. These ceased always in the horizontal position, but returned immediately when the child sat up or stood. She had been unable to go to school as her noises disturbed the class. This had lasted three months, but subsided rapidly on a generous diet and a mixture of bromide and belladonna. Usually, however, these cases do not respond to treatment by drugs. Any underlying cause, such as a local source of irritation, must, of course, be looked for, and if present treated.

Under the name of *Tic Convulsif* another group of cases has been described. Sudden spasmodic jerks of one or more limbs occur at varying intervals, sometimes only once or twice in the hour. With these jerks there is sometimes a sudden toss or rotatory movement of the head, and usually a loud snort or sniff, or an explosive utterance, it may be only a meaningless sound; one boy under our notice always gave vent to a sound like "dah" during the jerk, or it may be some foul word which the child has heard before. This condition is said to occur most often in boys; usually in neurotic children with a family history of insanity or neuroses. It must not be confused with chorea. It is certainly increased by observation, so that it is well to remove such children from too sympathetic friends, and the treatment in general is that of hysteria; but, like hysteria, the condition may be, as we have seen, extremely troublesome to cure.

Pica, or dirt-eating, is a curious psychosis which we have occasionally met with in children. It consists in a morbid craving for unnatural substances, which the child eats with avidity although the appetite for normal food is usually poor.

Such substances as plaster, coal, mud, wool, may be the particular favourites in individual cases, and, as might be expected, diarrhœa or constipation, and sometimes more serious gastro-intestinal disturbance, has resulted. The craving appears, as a rule, in the later part of infancy or in early childhood, and is often associated with some degree of general poorness of health. Dr. J. Thomson* draws attention to a characteristic physiognomy: the complexion "is dull and unhealthy looking. They are hollow-eyed, often with a hungry and unhappy look."

Improvement of the child's general health is likely to be followed by cessation of the craving; in one case under Dr. Still's care at King's College Hospital, the symptoms, which had lasted several months, disappeared very rapidly when the child was sent away to the country. In another case, an appetite for woollen material gradually passed off as the child grew older.

The condition is, of course, quite distinct from the dirt-eating, which is often seen in mentally deficient children; the subjects of pica are perfectly intelligent, and the condition is a transitory one.

Headache is very common in children, from six years old and upwards, and it arises from all sorts of causes. It is usually frontal and associated with sickness; sometimes it is one-sided, over one or other frontal eminence, and occasionally disturbance of vision accompanies it, as in the megrim of older patients.

Causes and Diagnosis.—It is not easy to distinguish between the different forms of headache. Most commonly the child is said to be subject to sick-headache; but, when the case is investigated—in one the ailment may be due to anæmia; in another to indigestion or constipation; in another it is the trait of a child of rheumatic parentage; in another the result of hypermetropia. To arrive at an opinion in any case, it is well first of all to examine the eyes by the ophthalmoscope so as to eliminate the last-named condition. A large number of children are hypermetropic, and when they begin to tax their eyes for reading, or fall into weak health, the strain upon the power of accommodation becomes excessive, and frontal headache arises, which may or may not be associated with internal strabismus. The headache is usually a supra-orbital one, and the letters run one into the other as the child reads. It is not unimportant to insist that these cases are often distinctly worse when the health is deteriorated from any cause. The strabismus may, indeed, only be noticeable at such times—like the decayed teeth, which, though always decayed, ache only now and again, in response to impairment of the general health. In another large group of cases, the children are badly nourished and anæmic. The relation of gastric disturbance to headache is more open to question; for it is certain that in many, perhaps most, cases of megrim, the stomach and brain react upon each other, and food will unquestionably excite an attack of headache, as a worm or other intestinal irritant will excite a convulsion. Headache is sometimes troublesome in girls at puberty, and is associated with catamenial irregularity and backwardness. The headache of brain disease is likely to be occipital, unless it be due to meningitis, when it is more general.

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* *Edinburgh Hosp. Reps.*, vol. iii. 1895.

Symptoms.—Sick-headaches usually manifest some periodicity, though it may be but an irregular one. They are oftentimes attributed to food, and they are associated with vomiting. The headache is frontal, often of throbbing character about the temples. The head is hot, and there is often some intolerance of light, or some hyper-sensitiveness of hearing. The victim is the subject of a terrible malaise, and for the time being only wishes to be left alone, and longs for sleep. The tongue is usually clean, the temperature normal, and the pulse not quickened. The duration of sick-headache is variable. It generally subsides in sleep and lasts but a few hours. Occasionally the vomiting is severe and repeated, and the child is out of sorts for some days. The anæmic headache is less localised, more continuous, and perhaps less often associated with sickness. In most cases of headache the bowels are irregular.

Diagnosis.—The ailment being a common one, there is some risk of overlooking the headache of organic disease. It will be well, therefore, to remember that bad headache sometimes ushers in typhoid fever—one of the common diseases of childhood—and that the headache of meningitis is usually associated with pyrexia and constipation, as well as its own more special symptoms. The hypermetropic headache may be suspected if there be hypermetropia, and if it be markedly frontal or orbital;

and the anæmic, rheumatic, and other forms must be diagnosed by reference to the appearance of the child, its past history, its family history, &c.

Treatment.—Headaches are usually troublesome for several reasons. They are common, are not thought much of, and their excitants are not therefore avoided as they might be; moreover, they are not immediately amenable to remedies—in many cases they hardly appear to be influenced at all—and the child slowly "grows out of them." The hypermetropic headache must be treated by the ophthalmic surgeon (not by the spectacle-maker), who will see that any anomalies of refraction or in the shape of the eyeball are properly corrected by carefully adjusted spectacles. Apart from this special form, all headaches are likely to be rendered less frequent by the prolonged use of such drugs as arsenic and iron, but they must be given for some weeks continuously, if they are to produce much effect. In the headache of girls at puberty, perhaps iron, permanganate of potash, and bromide of ammonium are most useful. For the attack itself, bromide of potassium may be given; it is sometimes successful in relieving the throbbing forms of sick-headache. Guarana and tonga are sometimes useful, although not easily administered. Guarana may be given as an elixir (Martindale), the tincture of guarana being mixed with equal parts of simple elixir (F. 46), and half a teaspoonful or a teaspoonful being given in water for a dose. But, upon the whole, sleep is the best restorative, and arsenic the most reliable tonic for keeping the attacks at bay.

Masturbation may be mentioned here, as in some cases it is closely related to neuroses, and may indeed be the early evidence of mental degeneration. It is probably much commoner in childhood and even in infants than is generally supposed. We have seen it frequently in infants both in hospital and in private practice, and in many cases where it was not actually seen there was good reason to suspect it.

It is not sufficiently realised that masturbation is by no means limited to boys; our experience leads us to think that it occurs with considerable frequency in girls.

In girls, as in boys, the stimulation may be produced by rubbing the thighs together, or against some object, or by handling the parts. In the case of infants the excitement is sometimes followed immediately by a profuse sweat, and the child lies back in the bed as if exhausted.

In older children, in whom the habit is much more difficult to detect, one may notice dark rings round the eyes, peevishness, languor, and perhaps a lack of healthy interest in the games and pleasures of childhood.

Treatment.—It is most important that parents and nurses should recognise the significance of thigh friction or whatever method of stimulation the child may use. Like other evil habits, masturbation is most easily checked in its beginning; but when the habit has been unchecked, as we fear it too often is, through the ignorance of the child's guardians, bodily and mental health may suffer, and the child may grow up to be the wretched sexual hypochondriac with whom every medical man is only too familiar.

Where the habit is known to exist in an infant, careful watching and mechanical restraint are necessary, and may be successful; or a small blister may be applied to the inner side of the thigh. In children a little older punishment may be advisable, but in these, as indeed in all cases, careful search must be made for any local irritant—a tight prepuce, threadworms, any local source of congestion, perhaps too warm clothing at night, perhaps even too rich a diet; any such possible exciting cause must be removed. In the case of schoolboys and schoolgirls our advice to parents and guardians would be—explain to them, with proper discretion of course, the harm and the wrong they are doing to themselves. Above all, do not lose the child's confidence, let him or her feel that you want to help them to conquer an evil habit. Make sure that their companions are wholesome; encourage them to take plenty of outdoor exercise and sport, to take an interest in natural history, botany or what not, and last but not least, ensure a cold bath every morning, light clothing at night, and the avoidance of late and heavy suppers.

CHAPTER XLVIII.

IDIOCY AND CRETINISM.

Idiocy is met with at any age, from a few weeks after birth onwards. In its slighter degrees it is sometimes called "imbecility," and every degree occurs, from mere backwardness up to the most extreme condition in which the child has no natural sense of any kind.

Infants are often brought for an opinion as to their mental capacity, because they take less notice than is natural, or are too placid, or make no attempt to talk, or walk late, or what not. In most of these cases the mother is over-anxious, and there is nothing wrong. The head is of good shape, the child is attracted by slight noises, and will evidently follow, though perhaps fail to make for, any glittering object which is offered it. Some children develop slowly, but, provided that some progress is made, it is unnecessary to conjure up imaginary possibilities. On the other hand, it occasionally happens too that blind fondness refuses to recognise idiocy when the mere shape of the head renders it patent to every one but the parents. In infants, however, it is by no means always easy to be sure of idiocy. The symptoms which should suggest it after the first few months of life are—weakness of the back, so that the child cannot sit up properly (it is not uncommon for a mother to bring her child to the medical man for this symptom only, having no suspicion that anything else is wrong); lolling of the head, as if the child were quite unable to support it; failure to notice its mother or its bottle; failure to grasp objects as a baby normally should do. All these, taken together with the shape of the head, the facies perhaps with big lolling tongue and rolling movements or nystagmus of the eyes, may assist the diagnosis.

A curious habit sometimes seen in idiots, especially with sight defects, is the passing to and fro of the spread-out fingers before the eyes, apparently for the pleasure of noticing the alternate light and shade. An idiot will sometimes sit for a long time amusing himself in this way.

Extreme restlessness is another characteristic of some idiots, and extremely troublesome such cases are to manage. Many idiots, particularly perhaps the epileptic, are spiteful and destructive, and if they are kept at home they require watching to prevent their doing any damage to other children.

In some of the slighter degrees of mental deficiency a tendency to smile in a fatuous way too often and without cause will sometimes betray the mental weakness.

Idiocy may be either congenital or acquired. In either case many varieties are met with, and attempts have been made to classify them, but the results can hardly be said to be altogether satisfactory; perhaps the classification suggested by Dr. Ireland is less open to objection than others.

The commonest variety of idiot, according to that writer, is the "genetous," *i.e.*, children defective mentally from birth without apparent cause: children they are with all degrees of mental weakness, sometimes good-looking, even pretty children, but more often unshapely, with head somehow abnormal in its outline, asymmetrical it may be, or with keel-shaped forehead, but not microcephalic; the palate is usually high and narrow, there is squint or nystagmus, occasionally marked exophthalmos, the ears are curiously shaped, the circulation is often feeble. Such cases are common enough, and all sorts of combinations of these "stigmata of degeneration," as they are called, are met with, but it must be clearly understood that any of them, sometimes several of them, may be present in children who are perfectly intelligent.

It is remarkable how often eye changes are met with in idiots of any kind. Taking nineteen cases, five were more or less amaurotic (only one of these had had fits), one had white optic discs, one retinitis pigmentosa, one a peculiar stippled condition of the choroid (? choroiditis), and two others were amaurotic without visible change in the fundus oculi.

One group of the "genetous" idiots calls for special notice, inasmuch as they are so constant in their appearance that any one who has once seen a typical case could hardly fail to recognise the condition again—we refer to the "mongolian" idiot.

Mongols are so called from their facies, the characteristic features being the oblique direction of the palpebral fissures, slanting upwards and outwards, the well-marked epicanthic fold on the inner side, the squat round face with high-coloured cheeks, and button-shaped nose with flattened bridge. The hair is usually dry and thin; the tongue shows between the teeth as if too big, and in children beyond the age of infancy has a remarkable appearance, due to hypertrophy of the papillæ. In some cases the surface looks like velvet with a very coarse pile; in others, where the condition is more marked, it has an almost mammillated appearance, and the whole dorsum of the tongue is divided up by branching fissures into irregular areas.

The head in these Mongol imbeciles is almost always below the average in its maximum circumference, and usually it is obvious that the contraction is mainly in the antero-posterior diameter; the occipital region also is peculiar in being flattened, so that the back of the head loses its rounded contour.

Dr. John Thomson has drawn attention particularly to the hands of mongol infants as a distinguishing feature from cretinism, for which the condition is very often mistaken. He says "the fingers are usually thick for the size of the hand, but taper at the tip, and are not so square as those of cretins. The little finger is generally dwarfed and curved towards the ring-finger."

Such children are slow in growth, physical and mental, but less so than cretins. They are often surprisingly quick at imitating, but otherwise slow to learn.

A boy aged three and a half years is at present under observation with the typical slanting palpebral fissures, high-coloured cheeks, scanty hair, dry skin and occasional squint. The ears are small, the arch of the palate very high and narrow, the bridge of the nose flat. He has bronchitis on the slightest exposure to chill, and there is often soreness of the eyelids, and discharge from the eyes. He is extremely affectionate, but very jealous of any attention paid to other children; he is also extremely obstinate. He imitates easily, but has, apparently, very little originative power; is fond of toys and music. At the age of three and a half years the fontanelle is still open, all the teeth are present, but decayed; speech is limited to about half a dozen simple words.

These mongol idiots are especially prone to soreness of the eyelids, nasal catarrh, and bronchitis, and many of them fall victims to tuberculosis sooner or later. Dr. A. E. Garrod has drawn attention to the frequency of the association of congenital heart disease with this form of idiocy.

In making a prognosis the tendency to early death from pulmonary disease must be remembered. Apart from this, parents may take comfort to themselves from the fact that these mongolian idiots make considerable progress with careful education: they learn to talk, though late, they are affectionate, and may be trained to be clean in their habits. We have seen no good from thyroid treatment in this condition, but some have thought that it did good. With regard to the prognosis of genetous idiots in general, we may quote the words of Dr. Langdon-Down: "The child who has been born with defective intellect is more susceptible of improvement by physical and intellectual training than the child who has been born with full possession of his brain power and has afterwards been deprived thereof, but each case must be judged on its own merits. Some of the worst and most hopeless cases are 'genetous' idiots."

Infantile Cerebral Degeneration (Amaurotic Family Idiocy).—Under this name cases have been described in which infants, almost all Jews, healthy at birth and free from any suspicion of syphilis, become gradually weak after two or three months. The child becomes unable to sit up, the sight fails, intelligence ceases to develop, the muscles waste, and eventually the limbs become rigid, the deep reflexes increased, and the head retracted; there is general emaciation, and the child dies usually within the first two years.

A characteristic feature of the disease is the early appearance of symmetrical white patches at the macula lutea and subsequent optic atrophy and blindness. Dr. Risien Russell and Mr. Kingdon have described four such cases, and found that, although there was no gross macroscopic change in the brain, microscopically there was extreme symmetrical degeneration of the cortex and pyramidal tracts.

Microcephalic Idiocy is one of the most easily recognised forms, but in its extreme degrees it is not common. These are children with heads much below the average size for the age (*vide* p. 31); the degree of intelligence varies, and bears no constant relation to the measurement of the head. In a general way no doubt it may be said that the smaller the head the lower the degree of intelligence is likely to be; and in some observations which one of us made on the circumference of the head in children supposed to be of average intelligence, it was noticeable in some cases that children with heads markedly below the average size for the age were below the average standard at school or backward in other ways; but, on the other hand, a small head within certain limits is quite compatible with perfectly normal intelligence. Dr. Ireland thinks that when the head fails to grow beyond 17 inches in circumference there will be some impairment of intellect.

It was thought at one time that the premature closing of sutures was the cause of microcephalic idiocy, but this view is now known to be erroneous, the imperfect development of the brain occurs before birth. Craniectomy performed in the hope of allowing expansion of the brain is an operation based on mistaken pathology, and experience has shown that it is useless. What little improvement is possible in these cases must be the result of careful training; they may learn to talk, and may even do simple work.

Other varieties of idiocy which scarcely need separate description are the hydrocephalic, the eclamptic, in which, as a result of convulsions, especially during the first few weeks or months of life, the intelligence is impaired; and the epileptic, in which a similar result follows frequently recurring epilepsy, *petit mal* being as disastrous in this way as *grand mal*. These epileptic idiots are apt to be mischievous, destructive, or spiteful children, troublesome to manage, and require careful watching: disappointing cases they are for treatment, but sometimes, according to Dr. Ireland, they improve much if the fits can be reduced in frequency.

We have already referred to idiocy as a complication of spastic paralysis (*vide* p. 575): it may also be due to traumatism, or to some inflammatory lesion, the result perhaps of one of the specific fevers or of a meningitis before or after birth. Sclerosis of the cortex has been described as another cause of idiocy, but in some cases at any rate the sclerosis is secondary to a meningitis.

Idiocy as the result of syphilis is said to be rare. Drs. Shuttleworth and Beach found evidence of inherited syphilis only in 1.17 per cent. of their cases; in cases under our observation at least 3.4 per cent. were probably syphilitic. The syphilitic idiot may be microcephalic, or may show no obvious abnormality of conformation; but examination of the eyes commonly shows definite evidence of the syphilitic taint, such as choroido-retinitis or vitreous opacities. A progressive mental deterioration sometimes results from inherited syphilis. We have seen cases, in which between the ages of six and twelve years children, with marked evidence of congenital syphilis, and said to have been previously intelligent, became more and more dull and heavy, with stupid fatuous appearance. Headache and epileptiform attacks have been present in some cases, and the child may become fat and gross, or, as happens in many cases during the later stage of the disease, much emaciated and bedridden with general flexion and rigidity of limbs, and death occurs after the child has become helpless and demented. Post-mortem a chronic meningitis or some lesion of arteries has been found. Probably some, at least, of the recorded cases of "general paralysis of the insane" in childhood are instances of this syphilitic mental degeneration.

Idiocy by deprivation of hearing and of sight must not be forgotten; and, on the other hand, it is important to remember that deafness especially with blindness may make a child appear idiotic, who is nevertheless potentially of perfectly normal intelligence. Such cases left untrained may indeed become to all intents and purposes idiotic. And the same might be said of deaf-mutism. Healthy children who have only recently learned to talk may lose speech altogether if hearing be lost from any cause, and it is probable that some of the deaf-mutes who have never spoken are so in consequence of ear disease in infancy. Great care must be taken not to mistake such cases for idiocy, and it is most important that as soon as they are old enough (5–7 years) they should be sent to one of the institutions for the training of deaf-mutes.

The **morbid anatomy** of the brain of idiots is one of considerable variety. The brain may be very small, or the convolutions may be rudimentary or simple. One part or other may be absent or ill-developed—the eyeballs and optic tract perhaps, or some part of the basal ganglia, or one side or other of the cerebellum. And in the acquired forms, thick membranes, pachymeningitis, cysts, thickening or deformity of the skull, &c., may be found in respective cases.

The **treatment** of all forms of idiocy, excepting cretinism, which is considered below, is much the same. A diminished brain capacity is the malady; to make the most of the little that is left is the aim of treatment. The individual is less highly endowed than the average; he is in a lower grade; he needs to be studied. He has to be educated, and it becomes the business of his instructor to instil habits of order, cleanliness, and obedience; to discover his likes and dislikes, his most sensitive nerve strands and centres, and generally to work along the lines of such senses as retain the most perception. Idiots must be educated objectively. They are to be made happy by every possible means. And to this end their surroundings must be pleasant; they must have a teacher whom they love; and their eyes, ears, and hands must be taught to carry instruction. A knowledge of colour and form can be brought home to them through the eye, and thus some of the fond memories and instant pleasures with which the beauties of Nature are associated; music may be made to charm the ear, and, making resonance amid the trembling strands, tone into life some pulses of thought; while the hand, by judicious exercise, may be made apt for various arts. It is by the application of means like these, backed by indomitable perseverance, and a capacity for seeing in the but slow progress of the day or of the year a comparatively bright future, that a success that must be called wonderful has been achieved at such institutions as Earlswood and Darenth. The education of the weak-minded must necessarily for the most part fall to such as have specially qualified themselves and who are particularly apt. Patience, perseverance, and ingenuity in the opening up of fresh channels of instruction are the great requisites, and a somewhat uncommon combination of mental endowments in the instructor is necessary to command success. Nevertheless, these cases will, under favourable circumstances, and with the requisite attention, improve much even in home life; and this hope is to be strongly impressed upon the parents, or those who have the charge of such children, as the motive for that continuous training which alone can enable the child to make the most of its diminished capital of brain power. Medically, there is not much to say, but that little is important. *Mens sana in corpore sano* is old and true ; but here the opposite is the more important truth, that the mind being feeble, the bodily nutrition and reparative power are feeble. Imbeciles require warmth, they require to live on a dry porous soil, to be guarded against sudden atmospheric changes, and to be fed well. Except in so far as idiocy is occasionally seen in an early condition, dependent upon brain disease, syphilitic or other, or upon some neurotic state, such as chorea, it does not call for any special treatment in the matter of drugs.

Cretinism, as commonly seen, is a disease which is endemic in certain parts of certain countries. In Europe, it abounds in Styria and the Tyrol, and it is not uncommon in the Swiss valleys, Savoy, and Piedmont. It is occasionally seen, though it can nowhere be said to be endemic, in England, in the dales of Derbyshire and Yorkshire ; but in this country it is more generally known as a sporadic affection, which owns no special habitat. Happily it is not common. Those who have charge of large asylums for idiots see most of it, and Dr. Fletcher Beach, late of Darenth Asylum, has published some interesting cases. Dr. Hilton Fagge was the first in this country to call attention to it, and to apply the title "Sporadic Cretinism," in a valuable paper in the *Transactions of the Royal Medical and Chirurgical Society.*

It is a curious and interesting disease, so strangely contradictory is it in its externals ; for in many respects age comes to the features in babyhood, while the blight of babyhood, in its weakness, imbecility, and puniness, settles upon the corporeal form, and withers the opening mind. The appearance of these cases is very characteristic. They cease to grow in very early infancy, and year after year they change so little, that the child of two or three remains much the same at eight or ten, or even twenty years. In two cases, that were for some time under my own notice, a girl of nine and a boy of fourteen had hardly altered, the girl since she was four, the boy since three years of age. They have a yellowish, chlorotic aspect, their skin is thick, harsh, and wrinkled, and the subcutaneous tissues in some parts seem almost œdematous, the eyelids being particularly puffy.

The scalp is also noticeable for its harsh, scaly condition, and the scanty growth of coarse hair upon it. The head is flat and broad, the forehead small, the face large, the bridge of the nose depressed. The limbs are large, the hands and feet flattened out, the abdomen large and pendulous, the tongue seems often too large for the mouth, and lolls from the open lips and teeth ; the teeth are irregular, deficient, stunted, and decayed. The thyroid has usually been said to be enlarged, but in some cases of sporadic cretinism it has certainly been wanting, and in others it has probably undergone atrophic or destructive changes. Attention, too, has been called to the existence of pads of adipose tissue in the triangles of the neck. They are often of considerable size, but I do not know that they have any further significance than as a part of the general tendency which exists, both in these cases and in the sporadic cretinism of adult life, or myxœdema as it is called, for the development of an excess of subcutaneous tissue.

Causes.—Consanguinity in the parent and alcoholism have been thought to predispose to a degenerate state of nervous system which may develop into cretinism, as into other forms of idiocy. But from the fact that it is a disease which attaches to particular regions, it seems clear that geological conditions play an important part in its production, and of these the existence of magnesian limestone in the soil is generally considered to be the most important. It is said that infants are liable to become cretins if taken to reside in districts in which cretinism is endemic.

We may mention here that we have occasionally seen children in whom an enlargement of the thyroid has appeared during residence in certain country districts, and in one case it was specially stated that the district was chalky. We have once seen two children in the same family, girls aged four and two-and-a-half years respectively, affected thus. The pulse in these cases was not unduly rapid, and there were no symptoms beyond the enlargement of the thyroid.

The tendency which the same geological conditions have to produce goitre, and the frequent co-existence of the two diseases, have long been a matter of interest, and the relation between the two diseases a subject of speculative inquiry.

A further point was made when Dr. Hilton Fagge showed from dissections that in some cretinous children the thyroid body is absent. We do not, perhaps, yet know the full bearing of these facts; but of late it has been shown by Kocher and others that cretinism has supervened in adult life upon extirpation of the thyroid; and in all the cases of myxœdema—a cretinoid state supervening in adult life, and with which the names of Sir William Gull and Dr. Ord will always be associated—that have died and been thoroughly examined after death, some twenty cases or more, the thyroid body has also been found to be atrophied and diseased. One of Dr. Fagge's cases, a girl of eight, fell ill with what was supposed to be a second attack of measles, and although perfectly healthy before, she became a cretin after.* Dr. Fagge remarks that, "taken with the fact that the thyroid body is congenitally absent in so many cretins, it certainly suggests the idea that the febrile illness led in some way to atrophy of that organ, and that this was the cause of the supervention of the cretinous state."† These observations go to show that the perfect functions (not alone development, for the disease may apparently be produced after the brain has developed) of the brain are in some way dependent upon the integrity of the thyroid. More recently still further advances have been made. First of all Victor Horsley produced symptoms and morbid changes in monkeys, by the extirpation of the thyroid, which corresponded closely to those of myxœdema in man; and later still it has been shown conclusively by a large number of clinical observations that these conditions are largely ameliorated, and indeed for the time quite removed, by supplying the body with thyroid extract, administered as it was first of all by hypodermic injection, and of late equally effectively by the mouth. Results so remarkable having been obtained in myxœdema in the adult, the same plan was tried upon cases of cretinism in childhood, and, as is now well known, these hitherto hopeless cases are found to undergo considerable improvement. A child that I saw some years ago, aged four and a half years, and who was subsequently under the observation of Mr. Maurice Duke, improved so remarkably that it seemed to have quite recovered. I have seen several others where the results have been almost as good, and many such cases have since been recorded.

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* Other cases like this might now be mentioned where an acute illness, such as influenza, an exanthem, or what not, has damaged the structure of the thyroid and led to its wasting and myxœdema.

† "Principles and Practice of Medicine," 1st. edit. vol. i. p. 756.

Morbid Anatomy.—Some confusion has been introduced into this subject by the mistaking of achondroplasia—"fœtal cretinism" as it was once called—for cretinism proper, from which it is now known to be entirely distinct. The most important feature of the morbid anatomy of cretinism is absence or some abnormal condition of the thyroid gland. The bones of the skull are thick, the sutures abnormally obliterated, and the various foramina are liable to narrowing. In a case under the care of Dr. Grabham at Earlswood, and mentioned by Dr. Hilton Fagge in his work on medicine (1st edit. vol. i. p. 755), the base of the skull was much altered in shape, the posterior clinoid processes being at a higher level than the anterior, and the sella turcica exceedingly narrow—the clivus was horizontal, and the cerebellar fossæ shallow.

The **diagnosis** of cretinism is usually easy, but it is not difficult to mistake mongol idiots for cretins, and achondroplasia may suggest cretinism. Moreover, in early infancy the characteristic symptoms of cretinism are but slightly marked, and in this stage it is easily overlooked.

Prognosis in cretinism depends to some extent on the age at which the thyroid treatment is begun. The earlier it is given the greater the improvement in most cases. Where it is most successful there is considerable physical improvement. The child grows, it loses its heavy stupid appearance, and much of its fat, and altogether looks more like a normal child; but the mental improvement, though considerable, is hardly as great, the intellect will always remain below the average.

Treatment.—Cretins must be removed from any place in which the malady is prone to occur, and taken to a dry and porous soil, and they should at once be put upon a course of thyroid extract. As yet we hardly know the limits of the range of action of the remedy, nor whether by its administration from time to time it is possible to maintain the natural processes at the proper standard of health for any length of years by this means. But what has been done is, at any rate, so surprising that, what might seem to be even extravagant hope, is not without justification. The remedy is a very powerful one, and requires to be given watchfully. The child just alluded to was fed on thyroid gland obtained from the butcher, and it seemed at times to produce maniacal symptoms and necessitated its discontinuance for a little while. Nowadays the introduction of tabloids as a means of administering even organic substances has made the administration of thyroid to older children easy; for an infant tabloids are, of course, unsuitable, but crushed and given as a powder they are very convenient at this age also. In very young infants, a grain would probably be a sufficient dose to begin with. It is well not to increase the dose at once, even though no effect is produced for several days, for the drug is one that has little effect in some and much in others. We generally content ourselves with one dose every other day to begin with, and increase the dose and the frequency as occasion seems to require. The younger the child the greater the caution; but we have more than once known faintness to be produced in adolescents of fourteen or fifteen years by one tabloid (five grains). The symptoms of ill-effect are headache, faintness, rapidity of pulse, nausea, and fever.

Moral Insanity.—There are other less definite conditions than idiocy and cretinism which are more common and perhaps even more important, for while the idiot is recognised by society as being more or less unaccountable for his actions, we tend to ignore the more obscure, but none the less real, condition of moral insanity, and in consequence of this neglect the unfortunate subjects of this deficiency, often in their childhood, but perhaps more often in their later life, are punished as criminals, when they should be under careful treatment and protection.

The moral defect is perhaps most often associated with some degree of intellectual dulness, but it is not always so; it may date from the earliest time at which a certain degree of moral control should be acquired by a normal child; it may on the other hand date from some illness or injury; cases have been recorded* in which after specific fevers, or gross cerebral disease, a child who has previously been normal in every respect, has seemed to alter completely in its moral character either temporarily or permanently.

Such aberrations are met with frequently enough in all degrees; some children are merely low cunning and mischievous, others are the subject of ungovernable passion. We remember seeing one little girl, who, when crossed in her wishes, would tear her clothes, break any dishes or china near, and bang her head in fury against surrounding objects. Her brother, a boy of eight years, was subject to similar outbursts of passion.

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* *Lancet*, April 19, 1902.

In another case a boy, the child of well-to-do parents, a bright intelligent boy, almost from his earliest childhood would steal any article which happened to please him. He seemed to have no sense of right and wrong, and no sense of truth, and yet, so far as intellect went, he was perfectly normal. Eventually he narrowly escaped being imprisoned, and had to be watched most carefully to prevent his getting into public disgrace.

It is most important that it should be realised that such children in the intervals between their moral lapses, so to speak, may appear normal in every way. The child who was a little fury during her attacks was a sweet docile child at other times; the boy who was repeatedly guilty of theft was otherwise a bright lovable child and a perfect little gentleman. A boy about eight years old was said to be troublesome and unmanageable at times, but there was nothing amiss in his behaviour while he was under our observation. He seemed quite bright and of average intelligence, but with a suspicion of instability about his manner. Two years later his mother brought him again, saying that he had become quite violent, and had actually attempted suicide, but even then, the temporary ebullition being over, there was nothing in the boy's manner to suggest that he was either mentally unsound or particularly vicious.

One cannot doubt that many of these cases are a fringe of ordinary insanity, and the family history often shows that there is a distinct neurotic heredity.

Treatment.—The first and most important point in the treatment of these cases is to secure proper supervision for the child. A reliable nurse, firm but kind, must be obtained for the younger children, while for the older home education may be better than school; but if school be advisable, let it be a small one where the authorities, who must, of course, be fully informed of the difficulty, can exercise personal influence and take an individual interest in the child. Little or no good comes of punishing such children; they are liable to an unnatural insensibility to physical pains; they must be protected from excitement and from any cause that is likely to call forth their particular weakness.

We may point out also that some of the ebullitions of passion in children are associated with bodily disorder. The child is worse when it is poorly, and the outbursts of excitement tend to react upon the bodily functions, and thus to make their derangement worse. It is important, therefore, in these cases to inquire into the child's general health, its conditions of hygiene, including diet and exercise; and in some cases a temporary use of bromides or arsenic may be advantageous.

Some children are **melancholic.** We have seen marked cases of this sort in boys and girls, the latter more often. Melancholic children are usually anæmic and haggard-looking, and decidedly improved by good feeding and absolute rest of mind and body. If there be any difficulty in their taking a requisite quantity of food, they must be dieted strictly, and made to take what is ordered. Such are fit cases for Weir Mitchell's plan of treatment, which has been so successfully advocated in this country by Dr. W. S. Playfair for some neurotic women.

Chorea Magna, so called, is also a mental disorder. It is not one that English physicians see much of. It has many resemblances to some of the more frenzied states of hystero-epilepsy that are happily but seldom seen in this country. The affected child becomes quite maniacal, and performs all sort of antics; dances, sings, declaims, or falls into a state of epileptiform convulsion or of cataleptic rigidity. It is a disease which is likely to come on as puberty approaches, but sometimes occurs in precocious girls from ten years old and upwards. It must be treated by the administration of such drugs as iron, bromide of ammonium, oxide or sulphate of zinc, and arsenic, the patient being under judicious management away from her friends.

Speech defects, especially stuttering and stammering, are very common in children, and if neglected may prove a grave hindrance in after life. To some degree they are certainly neuroses, and therefore a few words about them here may not be out of place.

Stammering is the inability to express certain sounds, or the substitution of one sound for another, as in lisping; it is often the result of bad example or faulty education; in some cases, however, there is a local cause, it may be an unduly short frænum linguæ, or it may be the presence of adenoids. Any local cause must be looked for and if present remedied. The child must be practised in the sounds which are difficult, and care must be taken that he associates with those who speak correctly.

Idioglossia is a curious and rare speech defect which consists really in an extreme degree of stammering. The child substitutes altogether different sounds for many consonants and vowels, so that speech is absolutely unintelligible, and the child appears to speak a language of its own. The speech is fluent, and the child may be quite intelligent; it may learn to read in its own way, and may write fairly well; moreover, it understands normal speech. One child about seven years old spoke thus, for "Father, come and play with me," he would say, "Barpa, narm arn bi mi moo." He could recite hymns fluently, but not a single word was intelligible to us; indeed it was difficult to imagine that he was talking English. The condition exists from the earliest acquirement of speech, and it is noteworthy that in several of the recorded cases there has been a family history of insanity. Some improvement has resulted from patient and careful education.

Stuttering, unlike stammering, is a defect of co-ordination in the mechanism of speech; as one might expect, therefore, as a transient condition it is almost natural in young children, who are still learning to talk; every one is familiar with the momentary difficulty of the eager little one as he tumbles over his words in his haste to express his ideas. But this stuttering should disappear as speech is acquired either spontaneously or by teaching the child to speak slower and more carefully; where, however, no trouble is taken to stop it, it may persist and increase, and is then often very troublesome to cure. In some cases, however, it appears later; we have known it to develop after acute illnesses such as diphtheria, sometimes it occurs after a severe fright. With stuttering there are almost always associated movements of the face or limbs, it may be frowning or twitching of the alæ nasi. It seldom occurs in singing, the rhythm of music and of poetry seems to assist co-ordination, and may thus be of value in the treatment of the disorder. Stuttering may disappear as the child grows up, but it is well not to build hopes on this possibility; teach the child to speak slowly and quietly, and try to stop the associated movements; but whatever method of treatment is adopted, much patience and perseverance will be required.

Another curious condition sometimes met with in children is complete absence of speech without any defect of hearing or intelligence. These children may be taught to speak by the "pure oral" method, but the acquired speech has the same monotonous character as that of the deaf-mute taught in the same way. Such a condition is no doubt due to some permanent central defect, and is to be distinguished from cases in which speech is simply unusually late in development; most children begin to talk in their second year, but speech may be delayed until the fourth or fifth year, or even later, and then develop perfectly.

CHAPTER XLIX.

CHOREA.

I SHALL commence my description of chorea by what may be considered a typical case, under my care in Guy's Hospital, and which has the advantage of an exceedingly good report by my then clinical clerk, Mr. Braddon. It is that of a girl aged eleven years, a thin, anæmic child, with thick red hair and vacant expression. She had never been ill, but was always considered delicate. Her father was killed by an accident eighteen months before her admission; twelve months later her brother died; and eight weeks before her present illness, she, a girl of eleven only, had to "nurse" her mother through an attack of rheumatic fever. During this time she had complained of pains in her limbs and back, was feverish, and took to her bed for two or three days; and from that time she grew duller, apathetic, and lost her cheerful manner. A month ago she had been scolded for clumsily upsetting a cup, and it was then first particularly noticed that the movements of her right hand were ill-conducted and that she was always twitching the right side of her face. Her right foot next became unsteady, and these irregularities proceeded gradually to constant convulsive jerks and twitches of either, but more particularly of the right side of the body. Five days before her admission, a game-cock flew at her, and frightened her so that she moped by herself and was speechless; and, till her admission, her spasmodic performances had increased in violence, and her talking and gestures had become unintelligible to her mother.

She lies in bed with her head twisted on one side, and rapidly changing in position if she is observed. She opens and shuts her mouth, twitching up its corners, jerks her head, and snatches the eyes irregularly from side to side. Her arms are thrown constantly before her on the counterpane with a tendency to place her fingers in any position but apposition, the forearm being mostly in that of over-pronation. The left arm is less distorted in movement than the right. When asked to pick up a pin, an irregular series of muscular actions takes place, tending ultimately to the desired result, but in which there is a noticeable tendency to the use of the adductors in excess of the abductors, and the pronators before the supinators. When asked to sit up in bed, she does so by an alternating use of opposite muscles, working upwards spirally like an eel, her legs generally crossed, but not much subjected to the irregular movements; the abdominal muscles take a fair share in the general jactitation of the body. When spoken to, she first cried and then laughed; she generally laughs, and at the same time the movements increase. She takes some time to gather head to answer, which she generally does with stuttering articulation and explosive manner. There was slight clonic response in the calf muscles on stretching the tendons, and the extensor tendon reflex was good, the superficial epigastric reflex being exaggerated. The heart-sounds were sharp-sounding, and unduly pronounced, but quite clear; the pulse irregular, soft, ninety-six per minute; a *bruit de diable* over the veins of the neck; the bowels were rather confined, the tongue flabby and rather furred. She was treated by ten-minim doses of liq. arsenicalis and kept in bed and fed well, and under this routine she soon became much quieter, and a fortnight after admission she was allowed to get up. On the sixteenth day she was still considerably choreic in both arms, and her heart was still irregular; a decided but remitting short systolic whiff had come at the apex, and another in the third left interspace near the sternum and over the third rib. The second sound was very accentuated, and the closure of valves could be felt in the second space.

If the student *studies* this report, he will find not only a truthful account of a case of chorea, but also in every feature that is described one of the common occurrences of that disease, whether it be the family history, antecedents, the appearance of the child, or the distribution of the movements, the posture assumed, the state of the mind, the behaviour of the heart, or any other of the many small deviations from normal health which together make up the disease. In it will be seen the association of chorea with rheumatism, and in this instance both by heredity and by the patient having suffered herself from that disease (the mother had had rheumatic fever, and in all probability the child herself). It is typical in the sex—chorea being far more common in females. Next it illustrates the relation of the disease to fright, worry, and overwork. All these things are powerful immediate provocatives of choreic movements, but they are, in all probability, not by themselves sufficient, in the absence of rheumatic strain or other predisposing nervous weakness. Next it may be noticed that the onset is slow. She is first dull and apathetic, next she becomes clumsy with her right hand, and the right side of her face is twitched, and so on, till the whole right side is affected, and her speech becomes unintelligible. Her posture in bed is characteristic. Over and over again a choreic child will lie in bed, with head, and perhaps body, twisted to one side, in the condition of pleurosthotonos, and then change suddenly to an exactly opposite curve. How often, too, does a choreic child lie extended in bed, making all sorts of grimaces, with "its arms stretched out on the counterpane," its fingers pointing in all directions but the natural one of "setting" towards each other, and the forearms and arms so rotated inwards and pronated as to make the palms look outwards. The crying and laughing when spoken to, the attempts to protrude the tongue, ending in its sudden appearance and as quick retraction, a flash of successful effort, an accidentally conducted message, amid the disturbance of the storm; and lastly, to conclude this preliminary sketch, the case may teach what is the not uncommon condition of the heart—that its action is irregular, and that, in the course of the disease, there is likely to appear a soft systolic apex murmur, the characteristics of which are not sufficiently pronounced to enable one to say whether there is any organic disease of the valves or not.

To define chorea is impossible; but Dr. Sturges hit upon a definition which is picturesque and sufficiently true for the purpose when he said that "chorea consists in an exaggerated fidgetiness." This description is a valuable one, because it will serve to convey the fact that chorea is a disease of varied degree. Sometimes it is so slight that all that can be said is that this or that child is an unusually restless one. It makes grimaces, or has peculiar finger movements, or it can never sit still, and so on. Fidgety children require watching; more violent movements may come on at any time under favouring circumstances, and then they have chorea; but it is merely a question of degree. As regards the movements, they are excessively irregular; they are as though the nervous current played about amongst the nerve-wires, and only now and again, by some determined flash of the sensorium, does the correct message find its way. But the disease tells most upon such muscles or groups of muscles as are most varied in their action—most under the influence of emotion, some say—and thus the muscles of the face and arms are those which suffer the most marked contortions.

Chorea often affects one side more than the other, when it is called "hemichorea." The left side, some affirm, because the left arm and hand are less under control than the right; the right side, others say, for reasons presently to be mentioned (p. 654). When the disease is one-sided, it not uncommonly assumes the form of paralysis, and choreic children are often brought for treatment because one arm is paralysed. The twitching finger, the shrug of the shoulder, or the grimace usually reveals the nature of the disease without trouble. But although chorea, more marked on one side than the other, is very common, hemichorea, in the sense of the movement being entirely confined to one side, is very rare, and I agree with Dr. Sturges that such a condition is almost unknown. Chorea is essentially a general disease, an exaggeration of a faulty habit of control, and, although most decided here or there, is present to some extent everywhere. In fifty-four cases I have particularly noticed the distribution. In thirty-four it was general; in thirteen more on the right side; and in seven only more on the left. But there is no doubt that the one side or the other is less often prominently affected than this, for while most of the unilateral cases are noted, no doubt no definite statement has been thought necessary in many that have been generally distributed, and it is probable that as regards the total number of my own cases (141) those in which the disease is mostly confined to one side would not have to be materially altered. It will be noticed that it does not coincide with my experience, that the left side is the more prone to suffer unduly.

The evidence of cerebral disturbance varies much. Not uncommonly choreics look completely imbecile, and they mostly laugh and cry from trivial causes and in a peculiarly explosive manner. But it does not appear that the chorea is dependent upon any definite cerebral disease, for it often goes with a brain which gives but little evidence of disturbance, and in others imbecility and movements improve together rather as the bodily health improves. In a girl, aged eleven, lately under notice, it was remarkable how the disease seemed to resist all treatment for some weeks, when suddenly, almost in a day, the child improved in appearance, the movements ceased, she began to get fat in the face, and then progressed uninterruptedly to recovery.

The history of chorea as regards its course is often one of much monotony, and for this reason perhaps in general practice it often fails to obtain the requisite medical supervision. It is difficult to say when chorea ends, and, consequently, to fix its duration. To be once choreic is to be always so to some slight extent, and, therefore, when the more violent movements are controlled, there is yet a lesser range which is still choreic and which must make one cautious in affirming a cure. It is no uncommon history for such cases to run on for two or three months, although when they are taken into hospital they almost always rapidly improve. But this is only up to a certain point; they then remain stationary, and the lesser movements of the choreic are often exceedingly troublesome.

Six to ten weeks is usually given as the duration of the disease.

Lingering, however, as chorea is, in childhood it very usually gets well. It is more liable to be fatal as puberty commences. Nevertheless death-tables do not show this very well, because the disease is so much more one of childhood than of adolescence, and although relatively the death-rate is small under fifteen, the aggregate equals that of the chorea of adolescence. By the records of Guy's Hospital it appears that twenty-eight fatal cases of chorea have occurred in thirty years, the respective ages of the cases being as follows:

Age	5	7	8	11	12	13	14	15	16	17	18	19	40–50
No.	1	5	1	3	1	2	1	1	1	1	5	2	2

1 pregnant woman, exact age not stated.
1 younger, age not stated.

I have had two fatal cases in young children, of which I give the notes. They very well illustrate the fact that when such an event ensues it is usually by the supervention of high temperature, rapid emaciation, and exhaustion—sometimes by coma. A fatal result may occur at any time, if the disease is complicated with much peri- or endo-carditis.

A boy, aged five, was apparently in perfect health till eight days before his admission, when he slipped downstairs. He did not appear to be much hurt, and had a good night afterwards. But the next morning there was some loss of power in his hands and difficulty in swallowing. Soon after that he began to scream at intervals during the day and occasionally at night. He had had pertussis and measles, but not acute rheumatism, nor was there any history of rheumatism, so far as could be ascertained, in his family.

He was in an irritable condition, resisting examination, but quite sensible and answering questions. He stared about in a vacant way, and his face, arms and legs moved in a choreic manner. He swallowed without difficulty, and there was no paralysis of the ocular or other muscles. His left knee was a little swollen and painful, and a loud systolic bruit was audible at the apex, and another, less marked, at the base. No subcutaneous nodules could be found.

He was kept at perfect rest in bed, and fed well, an ounce of brandy in the twenty-four hours being ordered likewise. But the temperature gradually rose to 103°, the movements became more marked, and deglutition was very much impaired. He was then ordered salicin gr. v. three times a day, and he was sponged occasionally; but he continued to sink rapidly, notwithstanding the administration of nutrient enemata, and subsequently of strong liquid nutriment, administered by catheter passed into the œsophagus through the nose.

At the inspection, general early pericarditis was found, a large fringe of vegetations round the mitral orifice, and smaller fringes on the aortic cusps. There was some broncho-pneumonia at both bases. The brain and spinal cord were apparently quite healthy.

The other case was a girl of seven—in some important particulars very similar; there was the same, but more marked, rise of temperature; the same inability to swallow as the case progressed.

Rosa L., aged seven, was admitted on October 14, 1881, and died on November 8, 1881. The parents are healthy. They have never had rheumatism, but the maternal grandfather was rheumatic. Of three other children, one has had acute rheumatism twice.

During the last six months she has complained of pains in her knees, which have never been swollen, and also of occipital headache. Fourteen days ago she became very excitable, and her hands began to twitch. She became gradually worse, and now the movements are universal and she cannot stand. There is no history of fright, but she passed a worm a foot long ten days ago.

When admitted she had severe general chorea—not marked on one side more than the other—without fever, and with normal heart sounds. She was ordered a teaspoonful of chloroform water t. d., broth diet, and was kept in bed. She did not improve, and, eight days afterwards, her diet was increased by two pints of milk, and six drops of liquor sodii arseniatis in glycerine and water were ordered. Her milk was increased to three pints on the 18th, or two days later.

The temperature, till now normal, began to rise, and on the 30th reached 102·8°. She became very restless, the movements almost continuous, and she was unable to swallow.

Nov. 3.—Decidedly worse. She is emaciating. Temp. 103.8°. The movements having eroded the skin of the back, she was slung in a hammock. Subsequently some purpuric blotches appeared on her legs, she became comatose, and died on Nov. 8, with a temperature of 105·4°. She was bathed before death to reduce the temperature, but without any appreciable result.

The inspection showed no morbid appearances, except in the heart and kidneys. There were sub-serous petechiæ all over the former, especially on the posterior surface of the left ventricle. The edges of the mitral were roughened, and to these were attached fibrinous warty vegetations the size of a pea. The kidneys contained infarctions.

Medicinally, succus hyoscyami and chloral were administered in the later days of the illness.

Of the thirty fatal cases, twenty-five were females.

Morbid Anatomy.—With one exception, chorea has no morbid anatomy. There is no one lesion of constant standing, save the fringes of vegetations which occupy the edges of the aortic and mitral valves; but endocarditis, in the form of vegetations, is present in the greater number of fatal cases. Of those already recorded (thirty in all), it was present in twenty-eight, doubtful in one, and absent certainly only once. The absence of vegetations is quite the exception. The mitral was affected alone fifteen times; both aortic and mitral valves nine times; the aortic valves alone four times; and pericarditis occurred with the endocarditis six times.

The constancy of these little growths upon the edges of the valves has led to a very direct, simple, and fascinating pathology for chorea, in the suggestion that it is due to embolism. The beads are, it is supposed, washed off the valves and carried into the smaller branches of the cerebral arteries, and thus produce local anæmia, malnutrition, and degeneration of the cerebral cortex and ganglia, which lead to the loss of control over the muscles. In favour of this view it is said that the disease is often one-sided, and most often right-sided, as is the case in hemiplegia due to embolism, and due, it is thought, to the straighter course the arterial passage offers to the transit of emboli to the left side of the brain than to the right. Secondly, in capillary embolism lies a rational explanation of the imbecility which so often accompanies the disease; and lastly, the smaller vessels have actually been found, by several competent observers, to be plugged in chorea.

But these various arguments are traversed in several ways. The preponderance of a right-sided affection, for instance, is denied by many; a strict limitation of the disease is undoubtedly rare. Supposing that one or other side suffers more severely, the affection is, nevertheless, present in other parts to a less marked degree. And as to the unilateral intensity, Dr. Sturges, whose experience is very large, and whose observation has been so careful and candid that it may well outweigh much that might otherwise point to a conclusion opposed to his, gives the seat of onset as thirty-six for each side. Dr. Pye-Smith, in an analysis of the cases in the clinical records of Guy's Hospital, 1870–72,* gives thirty-three cases of tolerably limited hemichorea, fifteen right and eighteen left. Out of fifty-four of my own cases, in which the distribution was carefully noticed, it was right-sided in thirteen and left-sided in seven; and I think it probable that larger numbers would make it still more evident that it has but little tendency to attack one side more than the other. Take next, the fact that choreic children are, almost invariably, peculiarly and recognisably fidgety or nervous—physiologically

* *Guy's Hospital Reports*, ser. iii. vol. xix.

unstable, and that the exaggerated or pathological condition may be followed step by step in association with excess of wear and tear, or in response to some sudden nervous shock. Next, if chorea be due to embolism, why is the heart murmur produced late in the disease ? And lastly, it may be asked, Why is chorea so uncommon in adults ? Embolism is common enough. Why is it relatively infrequent in children when compared with the frequency of endocarditis ? It can hardly be doubted that acute endocarditis, from whatever cause arising, leads not infrequently to capillary embolism, though not, it would appear, to chorea. Considerations such as these make it obvious that the theory of capillary embolism is inadequate to explain the larger number of cases of chorea, and we are quite prepared for what is found to be the case, that, opposed to such facts in favour of embolism as exist, is a large body of negative evidence, where the vessels have been examined without result. It seems to me that a study of this disease leads to the conclusion that it is one unassociated with any recognisable structural change in the nervous system—that it is, in fact, a functional disease. We see this in the antecedents of the child, both parental and individual—we see it in the disease itself, in the want of control, the emotional excitement, in some cases its relationship to hysteria, and its all but certain tendency towards cure. Although its pathology can only be clothed in somewhat vague language, yet that hypothesis accords best with the facts of the case, which supposes the existence of some depressed state of nutrition of the intellectual or governing centres. What the relation of rheumatism to chorea may be we do not know; but for my own part, I believe that the rheumatic taint, whatever that may be, points out the individual in whom it exists as one in whom various morbid nervous phenomena are likely to show themselves, whose nerve textures, cerebral more particularly, are easily impoverished, and being inherently bad or easily exhausted, discharge intermittently, erratically, and feebly.

Of recent years the bacteriology of rheumatism and its associates has been more carefully investigated, and one of the most interesting contributions on this point which has yet appeared in this country is that by Drs. Poynton and Paine, who have isolated a diplococcus from the joints, pericarditic exudation, inflamed valves, subcutaneous nodules, and blood in cases of acute rheumatism.[*] In a series of inoculations in rabbits, these observers have once produced a condition resembling chorea, and inflammation of heart-valves and joints occurred in others. With this quasi-chorea they found the diplococci in the pia mater, and in the endothelial cells of the blood capillaries dipping into the motor cortex from the surface. Other observers have found diplococci or other organisms both in the meninges and in the cortex in fatal cases of chorea ; and it is perhaps significant that Wassermann and Malkoff isolated from the brain in a fatal case of chorea a diplococcus which was probably identical with that found by Drs. Poynton and Paine in cases of acute rheumatism.

Evidently the whole problem of chorea and its relation to rheumatism must still be considered *sub judice*, and even if the constant presence of any particular micro-organism in the brain in chorea comes to be proved, we shall still have to consider what exactly is its relation to the disease, whether it acts perchance by the production of some toxin or by blocking the smaller vessels.

Predisposing and Exciting Causes. *Sex.*—Chorea is far more common in girls than in boys—ninety-eight girls to forty-three boys ; or close upon, but rather in excess of, two to one. If we take the statistics given by Hillier, M. Sée, Pye-Smith, Sturges, and my own, 1374 cases in all, the proportion is as much as five to two. The Collective Investigation Returns[†] give three to one. That it should be more common in females is only what was to be expected, seeing that it is a disease very closely associated with emotional disturbances, which are at all times so much more rife in the female sex. The disproportion becomes still more marked after twelve years.

Age.—The *age* at which chorea is most prevalent is between seven and twelve. The table annexed shows this at a glance :

Age	3	4	5	6	7	8	9	10	11	12	13	14	Over	Total.
Girls .	1	2	7	6	15	7	13	13	8	12	5	3	6	98
Boys .	0	4	2	2	4	6	7	8	4	1	3	1	1	43
Total	1	6	9	8	19	13	20	21	12	13	8	4	7	141

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[*] *Lancet*, Sept. 1900.

[†] "Report on Enquiry No. 11.—Chorea, prepared by Stephen Mackenzie, M.D., F.R.C.P.," *Brit. Med. Journ.*, vol. i. 1887, p. 425 *et seq.*

Chorea is apt to recur again and again in the same individual. In nineteen of my cases it is noted as having done so—in fifteen, twice; in two, three times; once, four times; once, more than this. It is not prone to occur in several members of a family. I have noted such an occurrence only three or four times in my series of cases. Nor is chorea, as chorea, transmitted in any large number of cases. Thrice only in 140 had it existed in one of the parents in former years.

Imitation.—There is a tradition abroad that chorea is likely to be set up in healthy children when they are associated with the choreic; and in the familiar fact that when one person yawns others in his company are likely to follow, we have an example of unconscious imitation such as the communication of chorea might be supposed to be. But there is no parallelism between the two. For whereas yawning is a perfectly orderly natural sensori-motor action, chorea is an irregular combination of involuntary movements on the part of muscles which are for the most part habituated to perform movements under the control of the will. One cannot conceive of the choreic movements being elicited by any mere sensori-motor disturbance such as starts a yawn, because the movements are of parts which are specialised, and such as want the control of any one centre. Thus, although choreic children in some numbers are admitted into the general wards of children's hospitals, instances of communication are rare indeed. I have never seen such a case. Dr. West and others have recorded instances, and no doubt they occur occasionally, but the risk is not great; and when they arise, they do so probably because some choreically disposed child has become startled by the sight of the contortions of its associate. This is illustrated by the history of a case that was in the Evelina Hospital—a girl aged nine years. Her mother had chorea twice, once when ten years old, and again at seventeen, and seven years before she had had rheumatic fever. The child's father had had rheumatic fever. The first child had had rheumatic fever, followed by chorea, a year ago. The patient is the fifth child, and in February 1881 had rheumatic fever. In June 1882 and February 1883 she had chorea; the first attack was caused by fright, and now from this attack a younger child had taken it.

Mental Conditions.—Fright, shock, overwork. In five-and-twenty cases of the 141 there was a distinct history of fright, and in six others the child was noticed to be unusually timid; in other cases the disease commenced after a fit, some exanthem, overwork, &c. Taking the figures of Dr. Sturges, Sée, Hillier, and Peacock with these, we have 670 cases, and 224 of them due to fright or some nervous shock or strain. This, probably, is too low an estimate of mental shock, for of 439 cases tabulated by Dr. Stephen Mackenzie from the Collective Investigation Returns, 222, or 50 per cent., were attributed to causes of this kind. It is worth remark that, although there is in so many cases a definite history of fright, the onset after it is often slow, and thus it happens that it is difficult in many cases to see any relation between the supposed cause and the effect; and doubtless, for the same reason, it happens that a cause such as this is at times entirely overlooked. I am disposed to think that one frequent cause of fright or nervous shock in children which is liable to be overlooked in this relation is nightmare. Nervous children are very prone to this affection, and nothing is thought of it; but those who have experienced the horrors of its "nocturnal tragedies"—the palpitating heart of the awakening, and the ecstatic relief which is then experienced, as "struggling and half vanishing, it is dragged into daylight" (Elia)—will know that, to an unstable nervous system, few things are more fitted to upset the balance and to induce chorea.

Rheumatism.—And here too comes in the question of the relation of chorea to rheumatism, because, although in the majority of cases, perhaps, the latter stands to chorea rather as a constitutional element which predisposes, yet in some it precedes the chorea and introduces it, so to speak, and may thus be said to cause it. Of a total of 141 cases, thirty-nine had had rheumatic fever, and fifty more had a history of rheumatism in some of their near relatives.

There has been much discussion as to what the relation between these two diseases may be—whether, even when we take into account the average of rheumatism which belongs to every family, there is any abnormal frequency of rheumatism in choreic families. After having gone carefully into the question, I believe some 30 per cent. of families taken indiscriminately are rheumatic, while for chorea the percentage is about 60.* I do not know that chorea is always rheumatic—it is possible that it may be a common method of nervous breakdown in nervous systems of unstable build, however produced; and a choreic child may as well be the offspring of the epileptic, neuralgic, gouty, hysterical, or passionate, as of the rheumatic. Choreic children are often anæmic, often spare, as if they had been living badly, though this is by no means always the case. Dr. Sturges gives it as his opinion that the choreic child is not uncommonly healthy-looking.

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* In 138 presumably healthy youths of seventeen to twenty years there were

But here we should like to draw attention to a point too frequently overlooked, namely, that the previous occurrence of rheumatism in the child or in its family is only part of the evidence in favour of the rheumatic nature of chorea. In many cases the chorea is the *first* symptom of rheumatism, and the further evidence of rheumatism appears later.

Some important observations in this connection were made by Dr. Batten* at the Hospital for Sick Children, Great Ormond Street. Taking 115 cases of chorea, he found that a history of previous rheumatism in the child was lacking in seventy-eight, while in thirty-seven, *i.e.*, 32.2 per cent. there was evidence of previous rheumatism. Three years later the seventy-eight cases mentioned were again investigated: nineteen could not be traced, two had died of non-rheumatic diseases, and of the remaining fifty-seven, thirteen cases had developed rheumatism. That is to say, the proportion which showed definite evidence of rheumatism had risen from 32.2 per cent. to 43.5 per cent. within the short period of three years after the attack of chorea. Three years later, *i.e.*, six years after the first observations, the remaining forty-four cases, which had not previously had rheumatism, were again investigated; only twenty-nine could be traced, but of these twenty-nine, ten had developed rheumatism, and one had died of heart disease, showing that, in spite of the impossibility of tracing all the cases, no less than 53 per cent. of the original number had now shown evidence of rheumatism as against 32·2 per cent. which had had previous rheumatism at the

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16 who gave a family history of rheumatism; 4 had had rheumatism themselves, and 6 suffered from cardiac disease without history. Of 96 cases of all kinds taken consecutively at the Evelina Hospital, there was rheumatism of some sort in the family in 24. And in 328 cases of all kinds and ages taken consecutively from my own private case-books there was a history of rheumatism in the family in 92 cases: of gout in 48 others.

* *Lancet*, 1898 vol. ii.

time of the chorea six years previously. One can hardly doubt, therefore, that if cases of chorea could be traced still further a much larger proportion would be found to have developed subsequent rheumatism.

Heart Disease.—As regards the heart disease of chorea, somewhat diverse opinions are held. The balance seems to turn in favour of the larger part of it being due, not to organic, but to functional disease. I cannot agree with this; making all due allowance for muscular irregularities, and a consequent temporary valvular (mitral) incompetence—a condition which undoubtedly exists in some cases—we have still other facts to consider: *e.g.*, that in fatal cases a fringe of vegetations, either upon mitral or aortic valves or upon both, is present in the majority of cases; and that cases of heart disease are occasionally met, with no other disease than chorea, as far as is known, to account for it (of 248 cases of heart disease in children, fifty-nine were associated with or attributed to chorea; fifteen, however, being due to disease the exact nature of which was somewhat doubtful); and that of choreic cases many in the long run suffer from definite valvular disease. Moreover, the non-existence of a bruit is no proof of the non-existence of disease. I have several times seen the mitral valve fringed with vegetations in chorea, when no bruit has been audible during life; more than once I have seen fatal embolism under like circumstances. It is most necessary to impress upon the student that the disappearance of a bruit is no proof whatever of the absence of organic disease; for if such cases are watched, they will many of them show subsequent signs, by disturbed rhythm and altered quality of sounds, that the changes in the valves are slowly progressing, and I have no doubt whatever that here is one of the sources of some of the many cases of mitral constriction that come under our notice.

But I am not blind to the arguments that are directed to weaken this position, nor to the real difficulties which envelop the question. The mere existence, for instance, of a soft systolic apex bruit is no certain evidence of organic disease. Many such murmurs disappear and leave the heart apparently healthy. There may or may not have been slight endocarditis, and the question can only be settled, as Dr. Donkin implies, by following up the cases for many years, and showing what proportion ultimately develops pronounced valvular disease, no other accessory having accrued meanwhile. I should be sorry indeed to suggest any disbelief in the existence of temporary, functional, or non-inflammatory affections of the heart in chorea. I have no doubt whatever that they are of frequent occurrence.

Irregularity of action is a very common feature of acute chorea, and by this I do not mean a necessarily violent chorea; for it is well pointed out by Dr. Sturges, in his masterly and philosophical essay on this disease, that the violence of the muscular movements has no correspondence with the frequency of the heart affection, and it is well known that in chorea there is frequently an altered quality of sounds, or an alteration in the rhythm. The existence of such a condition has, indeed, not been without dispute, but I think there can be no doubt about it. The cause has also been the source of much discussion. We cannot go far wrong in considering it as due to choreic disturbances of the heart muscle, and to be essentially the same as chorea of any other muscle. It is of little moment whether the effect be a paresis of papillary muscle alone, as some have contended, or a more general affection. It is only necessary to remember that the younger the child, and the more recent the case, the more likely is it to be present. It chiefly consists in a want of keeping time, the beats following each other at irregular intervals, or in an excited, or sharp, or sudden systole, which is less sustained than natural. The chief interest of this condition in a practical way is, however, the bearing that it has upon the previous question, that of the existence of organic disease; and it has been admitted that, given muscular irregularity, some temporary (functional) valvular incompetence—particularly, of course, of the mitral or tricuspid—is likely to follow. Some have even suggested that, if we allow this, then the vegetations found upon the mitral valve in cases of chorea are the *result* of such regurgitation, and a sequence such as this, as an occasional thing, is by no means improbable. But a still greater difficulty is found when we attempt to eliminate the element of rheumatism. If we grant that the two diseases are often associated and yet are distinct ailments, possibly without any causal relationship to each other, it may well be, as Dr. Stephen Mackenzie has contended, and Dr. Donkin's figures on the whole support, that the endocarditis of chorea is really rheumatic. Considering the indefinite nature of the rheumatic attack in so many a case in childhood, this question must be left open; as I think must also be that other already broached, and which has also been raised by Dr. Donkin. This writer narrates a case of chorea in which during life a loud apical bruit existed, and the patient dying, the valves were quite healthy. Apropos of this case I may quote the following: A girl of eight years was an out-patient at Guy's Hospital for chorea succeeding acute rheumatism. The heart's impulse was diffused and heaving, and there was a loud systolic bruit at the apex, which I no not doubt that I considered at the time to be due to endocarditis. She reappeared two years after for another attack of chorea, when I noted that the heart sounds were normal, except that there was some irregularity of rhythm.

Cases of this kind—and they are not infrequent—show how difficult it is to come to a reliable conclusion except by continuous observation of individuals for several years. But let me say again, as a caution in the opposite direction to the obvious point of these cases, that the subsidence of a bruit by no means negatives the existence of endocarditis, and it may well be, and I believe is, the fact, that endocarditis is present in many of the cases of transitory bruit; and sets going very chronic changes in the mitral valve which in years to come show as pronounced valvular disease. Having said thus much to suggest caution in the reception of any figures, and to show that there is ample room for observation on the part of the student himself, I may give the analysis of my own cases. One hundred and thirty-eight give sufficient information for the purpose: of these, I suppose forty-one to have had valvular disease, all but one mitral disease; twenty-two had apical bruits, which suggested a doubt, notwithstanding that they were persistent; in the remainder I have classed all simple irregularity of action and any bruit which is noted to have disappeared. Dr. Stephen Mackenzie* estimates the murmurs to have been persistent in 81 per cent. of his cases of chorea; and my own opinion is that the issue of chorea, as regards the heart, is, in no small number of cases, organic disease. Osler† states that he has carefully re-examined 110 of the choreic cases treated at the Infirmary for Nervous Diseases between 1876 and 1885, the examination in every case being made more than two years subsequent to the attack of chorea; in forty-three, the heart was normal; in fifty-four there were signs of organic disease; and in the thirteen remaining, a functional disturbance only. As regards the relation of valvular disease in chorea to rheumatism, fourteen of my forty-one had certainly, or probably, had rheumatism; ten others had a strong family history of rheumatism, but were not known to have had the disease themselves; so that in seventeen cases no history of articular rheumatism could be obtained.*

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* *Transactions Int. Med. Congress in London.*

† *American Journal of Medical Science*, Oct. 1877.

Complications.—In severe cases the temperature may rise and become hyperpyretic; when the movements are very violent and uncontrollable, the friction may produce nasty sores about the bony prominences or elsewhere. The severity of the paralysis or inco-ordination may expend itself upon the bulb, and the child be unable to swallow. Then, again, rheumatism, or one of its emissaries, endocarditis or pericarditis, may intervene—in what proportion of cases I find it difficult to say; probably not a large one. The Collective Investigation Returns make it about 12 per cent. I have already made mention of a case where the chorea was succeeded by rheumatism, and as the latter subsided the chorea returned. The subsidence of chorea at the onset of rheumatism has been noticed by many observers. Any acute illness may cause the choreic movements to subside; perhaps this is most commonly seen when acute pericarditis complicates chorea, in these cases the previously extensive movements may almost completely disappear, the child sinking down in the bed almost as if paralysed, while the chorea only shows itself in a slight occasional twitch of the fingers or of the face. We have known chorea to subside in the same way at the onset of lobar pneumonia. **Fibrinous subcutaneous nodules**, described by Barlow and Warner, are likewise found in some cases of chorea, as in acute rheumatism. Taking 124 cases of chorea without concurrent articular rheumatism, we found nodules in sixteen cases; and in three of these there was no cardiac bruit. Dr. Hillier† records a remarkable case of this kind, certainly one of the most extreme that has ever been recorded.

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* See also on this point Dr. Batten's observations, p. 659.

† "Diseases of Children," p. 238, Case v.

Prognosis.—This is, as a rule, favourable. The disease is troublesome rather than dangerous. Nevertheless, if the movements be very violent, if the temperature is high or slowly rises, if there be much peri- or endo-carditis, or if the disease assume the form of general paralysis rather than that of jactitation, the case may be regarded with anxiety. Certainly such cases as show much imbecility, with inability to swallow food, are dangerous, and require the most careful nursing.

Diagnosis.—It might be thought that the diagnosis of chorea presented no difficulty, and as a general rule this is certainly so. At the same time it must be remembered that choreiform movements occur in other conditions, and have in our own experience given rise to errors in diagnosis. For instance, a child under treatment for supposed chorea came under our observation; the irregular movements were just sufficiently unlike the true Sydenham's chorea to suggest a doubt to our minds: ophthalmoscopic examination showed advanced optic neuritis, and a subsequent autopsy revealed a cerebral tumour. Another condition which we have seen mistaken for chorea is the curious spasmodic jerk which some have called "Tic Convulsif," but which is perhaps better included amongst the habit-spasms; which also, as mentioned above, are commonly mistaken for slight chorea. We have also seen movements very like chorea in idiots occasionally, but in these cases, in addition to the mental state, there is a slight difference in the character of the movements, which will suffice to a careful observer for the distinction from chorea.

Treatment.—Choreic children are some of the most frequent attendants at the out-patient rooms of hospitals. Inquiry generally elicits the fact that they have been under treatment for some time, rather getting worse than better, and the parents have become tired of the want of improvement.* This is not because chorea is not bettered by treatment. Take any or all the cases into hospital, and in a very few days a marked improvement will be manifest. It is often said there is no treatment for chorea—it gets well by itself. It does nothing of the kind. Many a child will drag on and on in a most miserable state at its own home for weeks and weeks, getting worse rather than better, which, when taken into a hospital rapidly improves;

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* See also p. 491.

and I believe that this is because many are content to give a choreic child this remedy or that of the many that have been recommended as valuable drugs, and there the treatment ends. Where lies the difference in the result? Simply in this, that in hospital the child is kept in bed. Here is the first principle of treatment for all cases of acute chorea, the rest and quiet which bed offers. Other subsidiary details are by no means unimportant; regularity in the administration, suitability in the quality, of the food, and attention to the action of the bowels, are not to be neglected, but rest and quiet come before all things. The child should be placed in bed, and, if the movements are violent, it must be carefully protected by padding the adjacent sides of the cot, or in very bad cases the child may be slung in a hammock. The bowels may be cleared out with some compound decoction of aloes—some glycerine being added, as recommended by Mr. Squire, to make it more palatable—or by some jalapine (one or two grains); and if the sleep is bad, some Dover's powder, chloral, or succus hyoscyami may be given at night-time. A full milk diet is ordered, and some malt extract. As regards drugs, if the case is in any way acute, or violent, I order nothing, but the child is regularly shampooed twice a day for a quarter of an hour. This generally procures sleep; and by means of it, the good dieting, and the regular method of a hospital, great improvement is soon manifest. When, under this treatment, the more violent movements are quieted, then is the time to commence with drugs. I think there can be no question that no one can claim any great advantage over another. Sulphate of zinc, gradually increased up to ten or fifteen grains three times a day, is, I think, a most useful remedy, though very old-fashioned. Arsenic, gradually increased from five to seven or ten drops up to fifteen, or even more, is another, and in some cases it seems more effectual when given in the reverse way, that is, beginning with large doses of twelve or fifteen minims, and after a few days gradually diminishing the dose. However arsenic is given it is well to be on the watch for toxic symptoms, which occasionally manifest themselves even after quite small doses, and much more frequently after large ones, especially if long continued. The most serious of these is neuritis, though happily very rare, but gastric irritation may also be troublesome, and the minor symptoms, such as conjunctivitis, and, after too prolonged use, pigmentation of the skin are also indications for its disuse. With one or other of these drugs, and perhaps iron or cod-liver oil, it is best to content oneself. The most sedative drugs, such as the bromides, chloral, belladonna, hyoscyamus, conium, are of little real value, save as occasional draughts for sleeplessness, &c., in the early days, or to calm any unusually scared state of nervous system. Veratrum viride has been recommended as useful in chorea. I have tried it, but have seen no benefit from its use. Ergot, suggested by Dr. Eustace Smith, has seemed to us of use in some cases ; twenty to thirty drops of the liquid extract may be given three times a day to a child eight or ten years old. If the child is under close observation larger doses may be used with advantage, a drachm may be given every four hours or even every three hours as Dr. Eustace Smith recommends. In the last few years many of the cases of chorea that have come under my notice in hospital have been treated as follows : They have been put to bed and allowed simply to rest, with good feeding, for two days. At the end of that time massage has been commenced, and special diet ordered, as given in the Appendix of Formulæ. This treatment is carried out for a fortnight or so, when they are allowed to sit up in bed, well supported by pillows, and perhaps play with toys. I am never in a hurry to get them up, if the case has been in any way a severe one. The muscular strength appears to me to be recovered much better in bed, while it is remarkable how too early exertion will throw a case back.* When up and about again, arsenic or zinc, and cod-liver oil should be continued for some time, and the child guarded from any great excitement in its play. A quiet convalescent home or change of air is often advisable, and the parents must be instructed to be careful of the child for a long time, as the remaining choreic movements are liable to become aggravated even under trivial excitement.

For the most severe cases a warm pack has often been used by Sir Thomas Barlow at the Children's Hospital with success ; applied in the evening this may secure sleep, and seems to have a quieting influence which is beneficial ; the child may be left in the pack for twenty minutes or half an hour, and if then dried and made comfortable in a dry warm night-dress, will often settle off to sleep for some hours.

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* Fuller details of the treatment may be found in *Lancet*, 1882, vol. ii. p. 181.

For choreic children, as a preventive, there is nothing like regular exercise, short always of fatigue. Gymnastics of all kinds are excellent, as also are practices of any kind which tend to increase the voluntary control of the muscular system. Thus drawing, piano-playing, for younger children various kindergarten appliances, &c., are all useful, some for one case, some for another.

CHAPTER L.

RHEUMATISM.

"The fundamental difficulty in discussing rheumatism consists in defining what we mean by it," writes Sir Thomas Barlow; and, true as this is as regards adults, it is still more true of children, who comparatively seldom suffer from acute rheumatism in such a pronounced form as is met with in older people. Children, indeed, suffer from typical acute rheumatism, with its fever, its pain, its swelling of the joints, its sweating; but to circumscribe it by these limits would be to ignore the larger part of the field of its workings, and to form a most inadequate conception of what rheumatism is capable of doing in childhood, or of what I shall venture to call the "composite" of that disease.

Acute rheumatism in the adult we all know well. It is a disease which sends the patient to his bed for three weeks; which is attended with fever, with profuse sour sweating and miliaria; with swelling and redness of the larger joints of metastatic development; with much pain; and with, in many cases, acute peri- or endo-carditis and pleurisy, or pneumonia.

And the disease is found in children in like manner; the older the child, the more likely is it to be typical; but a classical attack of acute rheumatism may be found at any age. I have seen it as early as two years, and more doubtful cases even in children of two and three months only.

But, speaking generally, children's rheumatism is wanting in the severity of any one symptom, and its existence is often revealed by no more than one of many. There is but little fever—but, stay, we must hardly say that, for it is a common thing for young children to have a temperature of 101° or so, which, if not tested, would pass for nothing, for all the history that the doctor could obtain. It is probable, however, that the temperature is not often abnormally high, for more than a day or two. The profuse sour-smelling perspiration so common in adults is almost absent in children. Of sweating there is but little, and of acidity of smell none. The pain is less severe, and though the patients fret, they drag about. The joint affection is less severe, the swelling has to be searched for, and often it happens that the puffiness of one ankle or wrist, or knee, associated with pain, when pointed out to parents, has been recognised but thought unimportant. Supposing the illness is sufficient to keep the child in bed, it may still happen that only one joint is affected, and that with the slightest swelling and the faintest blush.

Many are supposed to be suffering from that popular delusion "growing pains," but natural growth is not a painful process. There can be no doubt that a large number of children suffer from rheumatism in this way, and never go to bed at all; others, perhaps, are kept in bed for a day or two, yet never see a doctor; and, in either case, when, years afterwards, some old valvular mischief needs explanation, there is no memory of the preexistence of any disease.

But what is true of these symptoms is not true of the heart. It is an old and thoroughly acknowledged maxim, that in rheumatism the younger the patient the more the risk of heart disease; * but more than this, since the *tout ensemble* of adult rheumatism fails in children, and this part or that is affected solely, so is it with the serous membranes of the thorax as well as with those of the joints. And though such cases are not common, an acute pericarditis or an acute pleurisy, is sometimes the first and the only evidence of rheumatism.

It is highly probable that an acute endocarditis may, in like manner, be the sole index of the rheumatic state. One might say that it certainly is so, but that from the nature of the evidence, demonstration is less easy. Unless one has watched the onset of the murmur, it is often impossible to say what is its age.

From this description it will be apparent that rheumatism in children is apt to be expressed by very indefinite symptoms.

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* Rosenstein traverses this statement, and says, "I consider the disposal to endocardial affections, on the whole, smaller in childhood than after puberty."—ZIEMSSEN.

If a child is suffering from acute pleurisy, for example, what is there in it that will warrant one calling it "rheumatic"? Probably nothing. The significance of indeterminate symptoms as indicating rheumatism has been shown by a careful study of life-histories, and it is by this study in individual cases that a particular symptom will have to be judged. Acute rheumatism, therefore, is not common. It is represented in childhood by what are called "growing pains," by a little transient swelling of one joint, by pleurisy, by pericarditis, by a progressive or persistent anæmia, which leads to a medical examination, when valvular disease is detected, and so on: nothing pathognomonic. The disease is only to be correctly appraised by the most careful inquiries into the family history and the small ailments from which the child has previously suffered.

It has been said that it is more common in girls than in boys, and in sixty-nine cases passing under my own notice, forty-two were girls, twenty-seven boys. The attack appears most commonly as a general one—that is, localised in no one joint, perhaps in no joint at all, but being associated instead with general pain or soreness all over. I find twenty-six thus generalised, fourteen others in which the knees were chiefly at fault, fourteen where the ankles were swollen, three only in which the wrists were alone affected. But there are other complaints which ought to be mentioned. Thus, four cases complained only of extreme pain in the side, which, in the absence of local inflammations of pleura or pericardium, must, I suppose, be attributed to a rheumatic muscular condition. The neck was alone affected once, the pericardium alone once. I have no note of anything that could have been called meningitis. At the same time, I have occasionally seen cases of meningitis in children with rheumatic family history, which have raised, though, unfortunately, not solved, the question of a rheumatic lymphangitis of this kind. The fever has generally been of the most moderate, or at any rate has easily been controlled by drugs. In the last ten cases taken from my note-books, which are a very fair sample of the usual run of such cases, the longest duration of any rheumatic symptoms was four days, except in two cases, where bad peri- and endo-carditis complicated the disease. Contrary to the opinion of some, I should say that relapses are uncommon; but I must add that this statement is based upon cases treated almost invariably by salicylate of soda or salicin.

In making this statement I am speaking of such recurrences of the disease as have some definite time-relation to the primary attack—that is to say, which occur within a few days or a week or two of each other; and I must also exclude what might perhaps be considered of the nature of a relapse, the onset of chorea as the rheumatism subsides. Children, like adults, once they have had rheumatism, are liable to recurrent attacks of pain of no great severity. As I have already said, these are by no means to be made light of, since they possess a well-known tendency to associate themselves with lesions of the heart and its valves; but I incline to consider these as fresh attacks, or indicative of the persistence of a *status rheumaticus* rather than as the recrudescence of a subsiding malady.

Heart Disease.—As in adults, acute pericarditis and endocarditis (the latter far more frequently) are boon companions of acute rheumatism. But for the reason already given—that the rheumatism so often escapes notice—it is almost impossible to say what proportion of cases occurs as the direct outcome of the one attack, and how far endocarditis results from some persistent state which slowly and surely damages the valves. Of my series of sixty-nine cases of acute rheumatism, fifteen had organic disease—one aortic disease, two pericarditis, and the remainder mitral disease; and five more had sufficiently pronounced symptoms of cardiac disturbance, such as alteration in quality of the sounds, displacement of impulse, irregularity of action, to make it probable that there was also actual disease.

Acute rheumatism is strongly hereditary; at any rate, it is common to find it in several members of a family. Of the same sixty-nine cases, thirty-two had a good history of rheumatism in close relatives, father, mother, or brothers or sisters; nine more had a moderate rheumatic strain, the disease having occurred in uncles, aunts, or grandparents; in four the history was vague; seventeen had no ascertainable rheumatic taint; and no statement was made upon the point in seven. The remarkable power of transmission which rheumatism occasionally shows is well illustrated by a case I published in the *Guy's Hospital Reports*, vol. xxv., where, with a rheumatic strain both in father and mother, five out of a family of six children under fifteen, all but a baby of fourteen months, had either had rheumatism or heart disease. A boy of fifteen had had rheumatic fever twice, and had mitral regurgitation; a second boy aged ten, was similarly situated; the third, a girl aged eight, died of mitral disease; the fourth, a girl, had rheumatic fever (after scarlatina), with subsequent progressive thickening of the mitral valve; and the fifth, a boy, aged four, was laid by all one winter with rheumatism. Steiner gives a yet more striking case, where a rheumatic mother had twelve children, and eleven of them had had rheumatism before the age of twenty.

The pathology of rheumatism is still a much vexed question, and it would serve no useful purpose to discuss so lengthy a subject here, but it may be said that of late evidence has been collecting which seems to point strongly to a microbic origin, and in that case the facts above given and interpreted as indicating hereditary transmission, may be explicable on other grounds. Drs. Poynton and Paine have isolated a diplococcus from the valves, the pericardium, the synovial tissues of the joints, the subcutaneous nodules, the blood and even the kidneys and urine in acute rheumatism, and with this micro-organism have produced polyarthritis, endocarditis, pericarditis and weakness with inco-ordination of movement which may have been the equivalent of chorea in rabbits.

The larger part of the rheumatism of childhood consists of isolated and, at first sight, disconnected ailments, which must now be enumerated seriatim.

Tonsillitis may be mentioned first because it is not only recognised now as a rheumatic ailment, but the frequency with which it precedes the onset of an attack of acute articular rheumatism has led to the suggestion that the virus of rheumatism, whatever it may be, may find its entry in some cases through the tonsils. It is probably more common in adults and adolescents than in children. I have notes of only a few cases of the kind; but it is an ailment which no doubt often passes unrecognised.*

Next we may take **chorea.** This, as one of the most prominent of the diseases of childhood, has already received consideration on its own merits in the preceding chapter; but in relation to rheumatism it is important to bear in mind that it may precede, more often it succeeds, and occasionally it alternates, so to speak, with rheumatism. Cases occur where chorea is followed, and, in great measure, replaced, by acute rheumatism, and as the latter subsides, the chorea comes back again.

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* Some interesting matter on this head has been published by Dr. Haig-Brown, Medical Officer at Charterhouse School, in a pamphlet entitled, "Tonsillitis in Adolescents."

Heart disease is another *symptom* of rheumatism. It happens over and over again that a pale and emaciated child is brought for treatment, mitral disease is detected, and yet there is no history of previous rheumatism. Inquiry reveals that one or other of the parents has had rheumatic fever; perhaps some one or other of the brothers or sisters also. We are fairly justified in regarding such cases—always supposing that the rheumatic attack has not been overlooked—as cases where the rheumatism has localised itself in a particular part. In a few cases I have seen even young infants with heart disease, which, had it not been that there was a rheumatic family history, would have been supposed without question to be due to malformation, whereas I should call them probable examples of intra-uterine endocarditis. Peri- and endo-carditis, in like manner, may be the primary disease, and the joint affection develops later on or not at all. As illustrations of some of these points, I may mention the following cases:

An infant, aged two-and-a-half months, ailing for four weeks. It was extremely pallid, with a cantering action of the heart, and a loud systolic mitral bruit audible all over the præcordia, and in the axilla and back. Its mother had suffered from what was probably rheumatic fever when twelve or thirteen years of age.

A boy of fourteen, with pains all over him, and extreme anæmia, was admitted for irregularity of the heart, and developed an acute pericarditis without any definite rheumatic swelling.

Another boy, about twelve, was admitted for pericarditis, and developed a rheumatic affection of the joints some three or four days later.

A girl, aged eight, with a rheumatic father, and who had suffered nine months before with rheumatic fever, was admitted with left pleuro-pneumonia, followed within a few hours by pericarditis She was in the hospital seventeen days, and had no joint trouble at any time.

Acute pleurisy and pleuro-pneumonia are sometimes the symptoms of rheumatism. They are very commonly part of acute rheumatism; but I am now more particularly alluding to the fact that, just as a pericarditis may be the only indication of rheumatism, so also may pleurisy or pleuro-penumonia. The case last mentioned is an illustration of this.

As other features of a rheumatic attack may be mentioned, first of all, certain acute erythematous affections of the skin. **Urticaria** is one of these; and for the rest, perhaps, **erythema multiforme** is the best general term, for the eruption is somewhat diverse in appearance—now papular, now marginate and occasionally associated with purpura. Next, there are the **subcutaneous nodules,** which have been described by Dr. Barlow and Dr. Warner. These are small inconspicuous masses, which occur mainly about joints. The back of the elbow, the malleoli, and the margins of the patellæ are the commonest sites; but search should be also made along the cervical spines, the crista ilii, the clavicle, the extensor tendons of foot and hand, the pinna of the ear, the temporal ridge, the superior curved line of the occiput, and the forehead. They may be solitary or in crops, are painless, and generally more palpable than visible. They appear and disappear in a few weeks, sometimes in a few days, and in rare cases persist for many months. They are often described as fibrous, but probably it would be more correct to describe them as fibrinous, and to regard fibrosis as a secondary change, which only occurs in the less recent nodules.* The microscopic appearances are indeed closely similar to those of a recent vegetation on the heart valves in rheumatic endocarditis, or of the exudation on the pericardium in rheumatic pericarditis; there is the same vascularity, with fibrinous exudation, and nearer the margin of the nodule there is cellular infiltration, and, it may be, ill-formed fibrous tissue. These nodules are of considerable importance in two respects. In the first place, inasmuch as they undoubtedly occur in the course of, or as a sequel to, acute rheumatism, they are of considerable use in establishing a diagnosis in doubtful cases; and in the next place, it has been shown by Drs. Barlow and Warner that they are almost invariably associated with disease of the heart, and more often than not with a progressive form of disease.

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* *Trans. Path. Soc.*, vol. l.

They are common in the rheumatism of childhood, although rare after puberty. In fifty consecutive cases of articular rheumatism admitted to the Hospital for Sick Children, Great Ormond Street, nodules were present in twenty-three—*i.e.*, nearly half the cases. And even if one includes cases of chorea and heart disease without concurrent articular rheumatism, the percentage is still high. In 200 children with rheumatic affections (chorea, articular rheumatism, endocarditis or pericarditis) nodules were found in fifty-five cases—*i.e.*, in 27.5 per cent. These statistics, however, were drawn from cases admitted to the hospital wards, and therefore apply only to the more severe cases; if one includes the slighter cases of rheumatism and chorea, such as one meets with in the out-patient department, the frequency of rheumatic nodules is probably not above 10 per cent.; we found nodules in nine out of eighty-four rheumatic children seen in the out-patient department.

There yet remain to be mentioned some few lesser ailments, which, whilst they do not appear to have any constant or even frequent relation to rheumatic fever, are nevertheless found in particular children, and sufficiently often, in those who have a rheumatic family history, to justify their inclusion in the composite of rheumatism.

Anæmia.—Children of rheumatic parentage are often habitually anæmic and thin. As a matter of practice, if I have to do with a child who is anæmic, thin, and of dark aspect, without any particular transparency or delicacy of skin, I always inquire very carefully into the family history, and I think that rheumatism taints more than an average of such. The rheumatic diathesis is said by some to be expressed by a fair complexion amongst other things. My own experience would lead me to say that a dark complexion was more prevalent. But this is a question which depends so much upon what individuals consider to be evidence of rheumatism, that I do not propose to attempt to upset the generally received statement.

Nervousness.—This is not a scientific term, perhaps, but it is one in common use with parents, and expresses a variety of conditions which are important to note. Of these a sub-chorea is one. A child is constantly fidgeting, or making grimaces, or performing irregular movements of fingers or hands, or is clumsy in its movements. Another is an irritable or exhausted nervous system after what to healthy children is moderate play. The nervous child becomes unusually excited while playing, perhaps suddenly bursts into a cry, or becomes ill-tempered without cause; or, after the game is over, seems quite tired out, and wants to lie down; or may be is actually languid and ill for some days. Sleep comes to such badly if at play towards their bedtime. They wake up fitfully, talking or screaming.

Nightmare is another rheumatic associate. It is very common—seventeen out of a series of thirty-seven owned a rheumatic parentage.

Headache.—Obstinate headache in children is frequently found in rheumatic families. It is prone to be associated with the anæmia of which mention has already been made. Of thirty-three cases of headache, twenty-three were of rheumatic stock, five of epileptic, and five only showed no abnormal taint.

Stiff Neck is another ailment quite common in childhood, and for which, perhaps, lumbago is substituted in the adult. Whether this be so or not, however, I should wish to teach that stiff neck, an ailment of childhood, and lumbago, one almost confined to adult life, are both diseases of the rheumatic strain. Sir Thomas Barlow suggests that the isolated phenomena met with in the rheumatic, and of which stiff neck is one, are the acute rheumatism of the adult distributed, so to speak, and it may be so; but I cannot say that I have noticed this condition at any rate in those who have actually suffered from joint troubles or heart disease at a former period; it would rather seem to be a substitute for the more typical affection. Amongst other troubles which may be said to be of this sort, I have noticed spasm of other muscles, causing sometimes retraction of the head, the peculiar in-turning of the thumb upon the palm, and the toes to the sole of the foot, which is called "tetany"; also muscular tremors of various kinds, stammering, and nocturnal incontinence of urine—all these things reduced to their cause, or to come as near to it as may be, are nerve discharges, excited by morbidly slight stimulation or conditioned by irregularity in the discharging act. And there is another feature of the rheumatic child which is no doubt allied to these—viz., a frequent stomach-ache soon after the ingestion of food. A number of such children tell a tale of pain during or soon after a meal, and this often associated with an action of the bowels. Their food is said by mother or nurse to run through them. Now what happens is surely this, that the nervous supply to stomach and intestine is morbidly irritable and responds to the introduction of fresh food by excessive vermicular action. I may perhaps add, as part of the argument, that a little opium, in the form of Dover's powder, almost certainly cures the complaint; and on similar lines, Dr. Marshall prescribes salicylate of lithia, he thinks, with great advantage.

Of **Skin Diseases,** psoriasis and various forms of erythema occur in the rheumatic, and erythema nodosum in a peculiarly marked manner; for of twenty-nine cases, nineteen were rheumatic, five only were certainly not so, five had not been interrogated upon the point. Allied, I suppose, to this affection is the purpura that occurs in the rheumatic, or the more definite peliosis rheumatica which occurs in the form of crops of purpuric tingling papules. But this is more common in adults than in children, in whom I have but seldom seen it.

Diagnosis.—There is less danger of rheumatism being mistaken than of its being overlooked; but I have several times seen a rheumatic hip give rise, by the persistence of pain and absence of swelling, to the suspicion of early disease of the joint; and there are other affections of the bones and joints which sometimes lead to mistake. There is an occasional acute suppurative disease of hip or knee in infants; there is acute disease about the epiphysis ending in suppuration, and attacking, as I have more than once seen, several joints in turn; there is the acute inflammation at the epiphysial lines which takes place in infants with congenital syphilis: there is the sub-periosteal hæmorrhage which occurs in scurvy; there is acute ostitis and necrosis with pyæmia—that fatal disease which is so common in childhood, and which is constantly mistaken at first for rheumatic fever; there are the effusions into the joints which take place in bleeders (hæmophilia); there is the pain and tenderness of rickets;—all these, by the pain and immobility which they occasion in young children, may be thought to be rheumatic without much difficulty, if we are not on the look-out to discriminate between them. And again, as Sir Thomas Barlow has pointed out, there is much in the early stages of infantile paralysis to liken it to acute rheumatism. There is often fever and general tenderness in the affected limbs; and Barlow records a case of a child in whom, for more than a fortnight, there was extreme tenderness and a little redness and swelling of the dorsum of each foot.

Having said this much, however, it may also be suggested, though I would not say positively that it is so, that the rheumatic state may act upon different individuals in different ways and thus may produce, in some, effects which we are wont to attribute to other causes. I might illustrate what I mean by this very disease—infantile paralysis. Here is something which suddenly produces fever in healthy children, and which ends in paralysis. We know absolutely nothing of the disease, except that it causes certain results. To any one who should affirm that infantile paralysis is due to the rheumatic poison we could say nothing, as we have no evidence for or against such an opinion, and clearly there is no reason why it should not take its place as one of perhaps a number of possibilities, however unlikely or small its chance, so to speak, may be. But the point of this is equally true as regards joint disease and serous inflammations in the rheumatic. We generally assume, in dealing with any destructive joint disease, that it is not rheumatic, because it is a generally accepted maxim that rheumatic inflammations are prone to resolve. But if, as soon as we see a chronic synovitis or destruction of a joint resulting from it, we at once exclude rheumatism because of the condition, what chance have we of ever ascertaining the natural history of the disease? I believe that permanent disease in various parts is no uncommon result of an attack of rheumatism which has been overlooked. We allow this much without question as conclusively established in the case of the heart, but for pleura or joint no such teaching is accepted. I should like to see a revision of statements on this point, based upon a careful inquiry into the life-history of the individual, his family history and antecedents, in all such children as are affected with chronic joint disease and empyema. Of course, such common affections are due to a great variety of causes, many of them in no way rheumatic, but I doubt not that rheumatic inflammation adds its quota to the total.

Chronic Fibrous Rheumatism.—A rare form of chronic joint disease which we have more than once seen in children has been described. Its morbid anatomy consists of a fibrous thickening in and about the capsule of the joint, and this may be the result of repeated attacks of acute rheumatism or may develop insidiously. We have seen such a condition in a boy aged three-and-a-half years; several joints showed firm thickening suggesting extra-articular increase of fibrous tissue; there was evidence of endocarditis, and many rheumatic nodules were present. Such an affection seems to prove that rheumatism may leave permanent results even about the joints, as is certainly the case in adult life occasionally.

Of **scarlatinal rheumatism** I have already said all that is necessary (p. 202). If it be a distinct disease, the counterfeit is at any rate so like the original as to be indistinguishable. There is the same metastatic affection of joints, the same tendency to the occurrence of an endocardial murmur, the same relief by salicylic acid treatment. It differs in one or two points, perhaps, if the type of disease be drawn from a large number of cases, for there is but little tendency to pericarditis; the endocardial murmur is prone to disappear—though this must not be taken to indicate absolutely that the bruit has been of a "functional" nature and unassociated with endocarditis—and there is some, though but slight, tendency to the occurrence of acute suppuration in the joints. These, however, hardly to my mind constitute any essential differences, and I look upon the disease as probably acute rheumatism. I am the more inclined to do this, as many cases which have occurred to me have been in rheumatic families, and I am therefore disposed to believe that it is a constitutional trait, which develops itself under the altered condition of health produced by the scarlatina.

Dr. Ashby distinguishes between true rheumatism and another joint affection which complicates scarlatina more commonly than it. It is, he says, not often associated with endocarditis; but a dry pericarditis of short duration, and unattended with obvious symptoms, is commoner than is supposed. The attacks are more fugitive; they rarely recur in joints when once they have left them; and they exhibit a favouritism for the backs and palms of the hands, the finger-joints, the soles of the feet and the cervical vertebræ. It mostly occurs from the seventh to the ninth day of the fever, and in cases where the pyrexia from the faucial inflammation is longer than usual. It is commoner in some epidemics than in others. True rheumatism, on the other hand, is more liable to recur in the third or fourth week—much at the time that nephritis supervenes, and endocarditis is by no means uncommon.*

Rheumatism has no morbid anatomy, save such as attaches to the heart, and to this belong no peculiarities. In the acute stage a little lymph may be found in the joints, and in any severe case there may be acute pleurisy, sometimes peritonitis, or acute pneumonia in association with acute pericarditis. In short, acute rheumatism is fatal by its pulmonary and cardiac complications, and when it is so, it is usual to find acute pericarditis and endocarditis, the muscular wall of the heart being pale, softened, and dilated; the weight of the heart is increased, and usually very much so, probably in great measure by acute inflammatory swelling, and the lungs are in that peculiar condensed, solid, sodden condition, of leaden colour, which has usually been called "œdematous." This condition is usually double-sided, and is associated with more or less pleural effusion.

The **treatment** of acute rheumatism follows the same lines as the disease in adults. The child must be kept in bed, between the blankets, or well covered in flannel, and any painful joints are to be swathed in cotton wool. The diet strictly farinaceous; milk and bread-and-butter, biscuit, &c., may be allowed. Since Dr. Maclagan first recommended salicin, all my cases have been treated either by it or salicylate of soda, the latter far more often, on account of its cheapness. By its means the attack, if free from complications, has been a disease of comparative unimportance, and relapses have been almost unknown. Eight, ten, or fifteen grains may be given every three hours; ten grains is the usual dose for a child of eight or ten, and it is given with syrup and acetate of ammonia; this usually for three or four days, when it is reduced to three times a day, and then, after a week or so, combined with quinine. Should there be any pericarditis or acute endocarditis, the chest is to be covered with wool, or spongio-piline, or poultices, and small doses of opium, in the form of Dover's powder, given three or four times in the twenty-four hours. Three or four grains of the powder may be given to a child of six or eight, and belladonna or digitalis must be given if necessary, according to circumstances. The salicylates are supposed to be inclined to disturb the heart's action, and are therefore sometimes discontinued when heart disease sets in; it has also been stated that, after its onset, their continuance is unattended with good effects upon the rheumatism. I always give it with caution and careful supervision in such cases, but I am by no means disposed to withhold it, unless there should be any distinct indications for doing so. But there is this to be said, that when the heart attack is severe, the joint affection is very slight, or none at all.

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* "On the Connection between Scarlet Fever and Heart Disease," *Lancet*, 1886, vol. i. p. 961.

The cardio-pulmonary condition, which I have described above, is a most puzzling one to treat. The child lies propped up in bed, extremely pale, with dilating alæ nasi and rapid breathing, the heart pumping away at 120 to 160 per minute; there is acute pericarditis and mitral disease also, though this is often uncertain from the confusion of sound produced by the pericarditis and the rapid action. The chest shows considerable dulness, and high-pitched tubular breathing, probably from the seventh or eighth rib downwards, at both bases. In such cases it is very difficult to say what drugs do good, and whether a case is to do well or badly. Undoubtedly the most essential requisites are careful nursing and judicious feeding; these, and opium given internally, will steer many cases through the pericarditis—the heart's action quieting down, and the pleuritic effusion and solidification of the lung slowly clearing off. But there are, unfortunately, many cases, not differing much in the physical conditions ascertainable, in which the child becomes more restless, vomiting supervenes (one of the worst symptoms possible in cases of this kind), and the child dies quickly. These are cases in which brandy must be administered freely. Ether is, no doubt, a useful drug under these circumstances, but it is not one that children take readily, and it is often vomited, in which case, however, it may be injected subcutaneously. This, however, is painful, and it sometimes produces death of the skin at the site.

Regarding the treatment of the rheumatic child—whether it be rheumatic by any attack of former acute rheumatism, or its tendencies are shown by some of the lesser ailments comprised by the term "rheumatism" and associated with hereditary taint—there is much to be said. Such children require the most watchful medical care, and much more than is usually considered necessary by their parents—uninstructed, as most of them are, as to the meaning of trivial ailments in such children. A tonsillitis, a headache, paleness, &c., do not necessarily suggest the advisability of an examination of the heart; but such conditions in these children are to be looked upon as part of the life-history of rheumatism, and unless the heart be examined—shall I say supervised, as indicating the necessity for prolonged watchfulness—disease may be creeping on where we least expect it. These are some of the cases where the doctor should be remunerated for keeping the child *well*, rather than called in to cure it when actually ill. His fee should be an annual retainer, irrespective of any illness, and there is no doubt that rheumatism and its results would be diminished. The management of the rheumatic child requires direction at all points. It is not only that its diet and its clothing require it; education and play alike call for advice in many instances, and the question of residence, although often quite beyond power of alteration, is one of vital importance. Of course, until we know what rheumatism is, we must deal to some extent in generalities, which may be very open to discussion; but with this admission, it may be said that warm flannel clothing is essential; the diet should be varied, and contain plenty of easily digested vegetables, in addition to the milk and ordinary meat food; and both as regards work and play, the slightest indications of excess, in the way of exhaustion—whether this be temporary or continuous, any headache, tendency to nightmare, or what has been called " nervousness "—must lead to immediate moderation. For such children the greatest care should be exercised in the selection of a school, both as to a dry, sunny climate, the home-life therein, and the happiness of the child; and unless all these things are satisfactory, it is far safer to keep the child at home.

The rheumatic child is one who requires drugs on occasion. Whenever it is below par, or getting anæmic, some good tonic should be administered, such as Easton's syrup, with which I am in the habit of combining *arsenic* as one of the most useful of remedies for cases of this sort. Three to five drops of the liquor sodii arseniatis, with half a teaspoonful of Easton's syrup, taken continuously for a month or six weeks, is a most valuable help in these cases; and cod-liver oil, stout, maltine, and such things are also to be recommended.

For the nervous or excitable condition, particularly in girls, the bromide of ammonium, bromide of potassium, hydrobromic acid, and manganese are of value ; and for the nightmare which occurs in younger children, bromide of potassium and hydrate of chloral combined, form almost a specific. Five grains of the bromide and five of chloral (half-drachm of the syrup) may be given to a child two years old, and continued as a draught at bedtime for a few days, with the almost certainty of success, care being at the same time exercised that the excitement of the day be reduced to its minimum. Of the abdominal pains I have already spoken, and advised the administration of Dover's powder, or salicylate of quinine or lithia. Such children require attention to the bowels, which are liable to be irregular. If so, some gentle aperient, in the shape of fluid magnesia, effervescing citrate, liquorice powder, syrup of senna, confection of senna, or the fluid extract of cascara sagrada, in doses of ten to thirty minims, may be given, and a little tincture of nux vomica also is sometimes of advantage. The treatment of nocturnal incontinence is discussed in "Genito-urinary Diseases," page 490.

Rheumatoid Arthritis or **Osteo-Arthritis** occurs in children occasionally. I have seen at least five well-marked examples—two in boys and two in girls, and one where memory fails as regards sex—from twelve to sixteen years of age. Four were severe cases—that is to say, attended by considerable pulpy swelling of many joints, large and small (fingers, wrists, knees, and ankles) ; three of them had moderate but persistent fever, all were anæmic. One, a girl, died of phthisis after a long illness. One, watched by my friend Mr. Sutton Sams, practically got well on iron in full doses. The others were hospital cases, and they passed out of sight unimproved.

Chronic Arthritis with Enlargement of Glands and Spleen.—There are other cases of chronic arthritis in childhood which seem to form a separate group,* and are characterised by fusiform thickening of joints without osteophytic change : the lymphatic glands are enlarged, and in some cases also the spleen. This affection usually begins before the commencement of the second dentition ; we have known it to begin at fifteen months.

The **prognosis** in any of these forms of progressive polyarthritis in childhood is grave. The children are apt to become bedridden, and then are easily carried off by some intercurrent illness. But the outlook is not always so gloomy, we have several times seen children who had been deformed and even unable to stand owing to chronic polyarthritis of the type associated with enlargement of glands and spleen, nevertheless improve greatly so that they were able to walk perfectly well, and in some cases had very little thickening of the joints remaining; but such improvement is very slow, and it is only after many months or even some years that any definite progress towards recovery becomes apparent.

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* *Med.-Chir. Trans.*, vol. lxxx.

Treatment.—A warm dry climate and good feeding are the most essential elements in treatment. Of drugs, arsenic (F. 16, 64) and cod-liver oil (F. 17) are probably the most useful. The hot-air bath certainly seems to do good in some cases. One point perhaps calls for special mention: it is advisable to let the child get up and use its limbs as long as possible, for when once it takes to its bed the hips and knees tend to become fixed in flexion, and it is no easy matter to straighten them again so as to enable the child to get about.

Gout, at any rate, in its articular manifestations, is hardly ever seen in childhood. Cases have, however, been recorded even at so early an age as seven years. These very early cases have generally occurred in families with a very strong hereditary tendency to the disease.

It must be remembered in the diagnosis of such a condition that rheumatism is occasionally limited to one joint, and we have seen it limited to the great toe in a case in which the subsequent course of the disease showed that it was acute rheumatism. Moreover in girls, sometimes even in infancy, a painful swelling of one joint is associated with the presence of a vaginal discharge, and is no doubt similar to the gonorrhœal arthritis of adults. On the other hand, it must also be said that acute gout may distribute itself over the larger joints, exactly as does acute rheumatism.

CHAPTER LI.

HEART DISEASE.

In studying diseases of the heart in children, it is necessary to be aware of a few preliminaries. The heart's action is more rapid than in adults. It is not necessary to burden the memory with the precise data for particular periods, indeed it is difficult to obtain any such, for the heart-rate is extremely variable at that age, but it will suffice to remember that at birth it is about 130 per minute, at six months it is about 110 per minute, and remains at this rate until the age of two years. From two to six it remains about a hundred, and then gradually drops to seventy or eighty. In early childhood there is a good deal of difference—often as much as twenty beats per minute—between sleeping and waking; the heart, of course, beating slow in sleep. This is naturally a matter of great importance in disease, for if the heart's action can be thus reduced, as much sleep as possible will certainly be advisable in cases in which the heart is diseased, and needs all the rest that can be obtained for it. This difference is said only to apply to young children. One cannot, however, dogmatise on this matter for it would appear, from some observations made for me by Dr. Newnham at the Evelina Hospital, that the amount of slowing is subject to some variability. In several cases it was noticed to be three or four beats quicker during sleep; although on the whole there was a well-marked reduction of four or six beats, and sometimes as much as thirty beats per minute; and this not confined by any means to the youngest children, but to those of seven, eight, and nine years. The heart's action is also less regular in its rhythm—one beat will be feeble, the next strong, and so on. The point of this is chiefly, as Meigs and Pepper remark, that caution must be exercised in drawing conclusions in cases of doubtful meningitis, in which disease an irregular pulse is one of the most valuable diagnostic indications. The heart's action is often more diffused upon the surface and visible than in adults; the position of the impulse with regard to the nipple is more variable, and the impulse is often higher than normal, in the fourth space. The præcordial dulness is a little larger.[*] Perhaps this would not be so in children of absolutely healthy standard; but so many suffer from moderate chest distortions, from bygone collapse of the lung and chest-wall, that the lung which should cover the heart more thoroughly is less expanded than natural. The heart-sounds are usually more tic-tac—that is, less sustained—than in adults; although, given an adequate cause—acute Bright's disease, for example—they may become thick and labouring as in an adult. This is well worth attention, for I have often had my attention called to the existence of albuminuria by the peculiar lengthening and labouring quality of the first sound. This is perhaps the more striking when one has to confess—at least I should do so—that any corresponding changes in the pulse can but seldom be shown to exist. It is very difficult, indeed, to gain reliable information as regards volume and force, and with the sphygmograph[†] I have met with little but disappointment in children.

Etiology.—There is not much that is peculiar to childhood in *diseases* of the heart, excepting, of course, the various congenital forms; but there are one or two points that are worth remark, and even where the diseases follow the same lines as those of adults, the obscurity of origin of many cases in grown-up people makes the various forms of heart disease in early life of considerable etiological value.

Steiner makes the statement that a useful rule in diagnosis is to consider all heart affections occurring under four years of age of congenital origin, and that only after that age do the acquired diseases make their appearance, because their chief exciting cause, rheumatism, is seldom met with in children under four years of age. But this rule must not be insisted upon too rigidly.

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[*] For some careful observations on this subject see Starck, on "The Situation of the Apex of the Heart in Infancy," &c., *Arch. f. Kinderheilkunde*, ix. 4, 5; also in *Rev. Mensuelle des Maladies de l'Enfance*, 1888, p. 515.

[†] Dr. H. Oliphant Nicholson has lately written an interesting note (*Scottish Med. and Surg. Journ.*, May 1901) on the sphygmographic appearance of the pulse in infancy.

Acquired heart disease is no doubt much more common over four than under; but those cases which occur in younger children must not be too hastily assumed to be of congenital origin, if by congenital we mean such conditions as are due to malformation rather than to disease. If we take my own cases, the figures stand thus:

Rheumatic heart disease . . .	134 cases.
Non-rheumatic, or with no history . .	55 ,,

The heart disease of chorea may be excluded, because it, no doubt, seldom occurs before four years of age. The age is noted in 169 cases of these:

1 and under	2	3	4	5	6	7	8	9	10	11	12	13	14 & over	Total.
10	2	4	9	10	19	12	16	14	20	18	11	4	20	169

Sixteen cases, therefore, occurred under four years of age. Of these, twelve, or three-fourths, it is true, are headed as "congenital"; but of the twelve cases so-called, five were associated with a simple systolic bruit, which, in an adult, would certainly have been attributed either to mitral or tricuspid regurgitation; and no doubt we are too apt to conclude that when some cardiac murmurs are present in infancy there is malformation of the heart. The following case may point this remark:

A male child, aged two months, was admitted into the Evelina Hospital for cough and stomatitis. It was illegitimate, brought by a woman in charge, who stated that it had been ill three weeks. It was in a moribund state, and very thin. Temperature 103°. Respiration and pulse not to be counted. There was a loud systolic bruit heard at the apex and all over the right side of the chest. It died in a convulsion within a short time of its admission. At the inspection, the mitral edge was thick, and on its surface were abundant inflammatory granulations, uniformly distributed round the orifice, and quite sufficient to interfere with its efficient closure.

I could give notes of several other cases of infants but a few months old in whom the physical signs were in favour of simple mitral regurgitation. I may also add that Mr. Bland Sutton, in a paper read before the Royal Medico-Chirurgical Society,* upon the value of the systematic examination of stillborn children, has published a case of recent endocarditis in an eight months fœtus, the pulmonary and aortic valves showing soft vegetations, and the mitral being much puckered. This distinction between disease and malformation, though not always practicable, is clearly an important one.

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* *Med.-Chir. Trans.*, vol. lxvii.

Causes.—Of two hundred and forty-eight cases of heart disease in early life which have passed under my notice either at Guy's Hospital or the Evelina Hospital for Children, twenty occurred in the course of acute rheumatism; one hundred and thirty-four are set down as rheumatic (occurring, that is to say, either as the sequel of actual rheumatism, or in families with rheumatic history); fifty-nine gave a history of chorea, or were actually choreic at the time they were under treatment; and fifty-five could not be attributed to any definite cause, if we except seven, or, at most, twelve, which may have been congenital.

As regards causes of valvular disease other than rheumatism and chorea, of which there must surely be very many, though no one at all approaches either of these in importance, scarlatina probably comes first; but other exanthems occasionally lead to endocarditis, and diphtheria, pneumonia, pleurisy, typhoid fever, syphilis, and pyæmia are all occasionally to be found in its company.

It is, moreover, interesting to note how valvular disease is more common in females than in males all along the line, not only in the rheumatic and choreic cases, but also in others:

	Females.	Males.	Total.
After rheumatism	89	45	134
Choreic	45	14	59
Other	33	22	55
	167	81	248

Next, as to the nature of the valvular disease:

	Rheumatic.	Choreic.	Non-Rheumatic.	Total.
Mitral	79	39	29	147
Aortic	3	7	1	11
Aortic and mitral	8	11	3	22
Doubtful	44	2	10	56
Congenital	—	—	12	12
	134	59	55	248

This table shows how large a proportion mitral disease bears to other forms. Eleven cases only out of the total were simple aortic disease, twenty-two others had both aortic and mitral disease. Doubtful cases form a large group. This heading is not intended to indicate that the existence of the disease was doubtful, but only that its exact nature was not to be precisely determined. Under it are classed all cases of thick sounds, thumping action, displaced heaving impulse, in some of which no doubt the mitral was at fault, and in others I have suspected an adherent pericardium. But I do not doubt that if mitral disease had its due, many of this group would fall to its share; and this would raise the proportion which mitral disease bears, so overwhelmingly, as to reduce all other forms to a numerical insignificance. If, next, we inquire further into the form of mitral disease, in five cases a pre-systolic bruit existed, and ten others probably had a contracted mitral, whilst doubtful cases of the same are included in the group devoted to doubtful cases. Therefore, not only can it be said that mitral disease is the common form of heart disease in childhood, but that mitral incompetence, or mitral regurgitation, is by far the commonest form of mitral disease. I lay stress upon this, because it is said and taught that there are two different forms of mitral contraction, and one of them is of congenital origin. If so, it should show itself in children; whereas, in very young children, mitral stenosis is almost unknown, whether we look for it at the bedside by auscultation or in the post-mortem room. I have long been looking for such a specimen in children under five years of age, and have never yet seen one. Mitral regurgitation is common enough, but mitral stenosis is not found until we come to deal with children of eight or nine years of age. It is not at all common at that age, but after that it becomes so as years advance, and, as we all know, it is one of the chief cardiac diseases of adult life.

A girl of four years was in hospital from June to November 1882, with acute peri- and endo-carditis, and acute pleurisy, with consolidation of the base of the left lung. Her illness was attributed to cold caught six weeks before her admission, and neither personal nor family history of rheumatism could be elicited. After she left the hospital no more was heard of her until, thirteen months later, she came back to die. There was still, as there had been when she left the hospital in the previous year, a loud systolic mitral bruit, and the impulse of the heart was inside the nipple. Convulsions were the immediate cause of death.

The inspection showed a large heart with an adherent pericardium. The mitral valve was considerably thickened, but the aperture admitted one finger. The aortic valves were thickened.

I give this case because it is typical of the cardiac changes one may expect to find in young children, and of the conditions which lead to death. The pericardium was firmly adherent, and the heart large and no doubt dilated. The mitral valve was considerably thickened, but not yet substantially contracted, for it admitted one finger, which is a fair capacity for the heart of a child of five years old.

In this case there was pericarditis and this is so closely associated with endocarditis that any description of the heart lesions in rheumatism must include also inflammation of the pericardium; in children with rheumatism more than in adults there is a tendency to inflammation of all the tissues of the heart, endocardium, myocardium, and pericardium, a tendency which Dr. Sturges expressed in his term "carditis." We shall refer to the pericarditis more fully below (p. 692).

But there is another form of heart affection, and probably one of no mean importance, which must be mentioned here, namely, **simple dilatation.** Dr. West records several such in which no disease of the valves was found post-mortem, and we have seen it repeatedly. It is by no means a rare occurrence in acute rheumatism ; indeed, in its slighter degrees, it is probably frequent. It has many a time been seen that after an attack of acute rheumatism the only change discoverable in the heart was simple dilatation. We must always be alive to the possibility of the existence of this condition, and take it into consideration in endeavouring to unravel the nature of individual cases of mitral incompetence. As I have already said, the heart probably dilates in childhood with undue readiness. It is this which constitutes the fatal element in so many cases of acute heart disease, and yet, if on the watch to avert it, and prompt to recognise it on its first occurrence, no doubt much may be done towards saving life, and sometimes towards restoring a heart to a normal condition, which, were it not for this, would pass on into incurable disease.

Dilatation of the heart is seen, however, in many other conditions besides rheumatism. We have seen it especially in connection with post-scarlatinal nephritis (*see* p. 208), in which it is a symptom of very serious import. It occurs also independently of nephritis after scarlatina, diphtheria, measles, typhoid fever, influenza, in diphtheritic paralysis, and in septic conditions of all sorts; in some cases, no doubt, as the result of degenerative processes in the heart muscle dependent upon toxic substances in the blood; in others the result of defective nutrition of the myocardium from prolonged anæmia.

As regards **symptoms**, or the course of the disease, children are peculiar in one or two respects which are worth noting. They emaciate more than is customary with adults, and the younger the child the more markedly is this the case. In very young children the extreme emaciation and pallor of simple mitral regurgitation would often suggest a pulmonary rather than a cardiac affection, until auscultation reveals the true condition; and I think it may be said, further, that physical examination reveals no other evidence of the cardiac affection than the murmur, disturbed cardiac action, and increased præcordial dulness. In young children there is liable to be an absence of the hepatic enlargement which is common even in children a few years older—of seven, eight, or nine years. Heart disease in very young children—of one, two, or three years old—is a wasting disease. The reason for this is probably not far to seek: the cardiac defect at this time of life leads to impaired nutrition, as it does at any time; but now such interference is vital, and rapid wasting results. The wasting so reduces the total blood-supply that the circulation keeps within bounds, so to speak, and the mitral incompetence does not therefore produce those extreme congestions of liver, spleen, and kidney which are its common features at a later stage. For a similar reason, probably, severe cardiac dropsy is not common in older children. We see a child with all the local evidence of an enormous heart and with a large pulsating liver, perhaps without any ascites and generally without much anasarca, but such are always pale and always thin. Perhaps it is owing to some explanation of this kind that chronic heart disease of children is in many cases amenable to treatment, as regards relief to urgent symptoms. The blood stream, diminishing, as it does, in proportion to the emaciation, is less likely to be dammed back irremediably in the lungs, and a temporary rest, with tonic and aperient medicine and careful feeding, certainly enables many a case of permanent mitral disease to go on for years.* It is difficult to prove, but I have thought, after watching many of these cases for a long time, that here is the source of part of the number of cases of mitral stenosis that are met with in adolescents and adults. May not the diseased heart of infancy and early childhood, when recognised and fairly tended, be kept going until, in the natural order of things, the mitral inflammation—which at its outset produced incompetence—contracts, cicatrises, and, so to speak, culminates in a cure in one sense—viz., a contraction of the orifice? The natural tendency of all inflammatory conditions of the mitral valve is towards constriction of the valve, but, like its parallel, urethral stricture, in the presence of an active dilating force—in the one case the passage of the urine, in the other, of blood by muscular propulsion—years pass by before any serious amount of disease is produced.

The symptoms of both endocarditis and pericarditis, in children of any age, are liable to be very obscure. A short, dry cough, breathlessness on exertion, and palpitation, may be all that have been noticed, combined with a gradual loss of flesh. But when examined, there may be the rounded chest, the increased præcordial dulness, the displaced, diffused, and heaving impulse, the roaring systolic bruit, which betoken not only old valvular disease, but consecutive hypertrophy and dilatation also.

Rheumatic pericarditis occurred in twelve cases out of the series referred to above (p. 688). In six it was associated with acute valvular changes in chorea, in six with acute articular rheumatism. It is therefore less common than endocarditis†; but when it occurs it is almost invariably associated with endocarditis.

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* West gives several cases of the kind, and refers to a passage in Dr. Latham's book of similar purport.

† I am now only dealing with my series of hospital cases. I have seen it more commonly than these figures indicate, but that is probably, as I have remarked for empyema, because outside the hospital, more than inside, the practice of the hospital physician lies amongst the worst cases, not those that are mild.

Symptoms.—Often the onset of pericarditis produces little or no alteration of symptoms to attract attention in a child already labouring with endocarditis; but the occurrence of vomiting without apparent cause, together with breathlessness, and a little working of the alæ nasi, and a frequent short dry cough, and a rise of temperature, should suggest the possibility of its occurrence. In some cases, but by no means in all, there is definite pain or oppression referred to the pericardium, and sometimes tenderness here on percussion. The physical signs are by no means obtrusive; the heart's action is generally rapid, and often has a confused tumbling character or a cantering rhythm, which to a practised ear may suggest the diagnosis. Friction sounds may be absent altogether, but more often some will be found on careful auscultation about the base of the heart. There may be little more than a mere scratchiness of the heart sounds, or the friction may closely simulate a to-and-fro bruit, while in other cases a loud churning friction is heard all over the præcordium. The friction sound may also be masked by the existence of a neighbouring pleurisy. Percussion will almost always reveal a greater or less degree of cardiac dilatation.

Acute peri- and endo-carditis are noteworthy in children as more liable than in adults to lead to a rapidly fatal termination. Whether the inflammation is more severe in childhood may perhaps be doubtful; but at any rate the heart swells more quickly, its cavities dilate more readily, and a very few days illness may determine a fatal issue. I once had a case of a young man, above the age, it is true, with which we are now concerned, who, to all appearance, had a healthy heart four weeks before his death. He was seized with acute pericarditis, and at the post-mortem the heart weighed 19 oz. This looked at first like acute hypertrophy, and no doubt in part it was; but subsequent experience has made me think that the criticism of Dr. Coupland, made at the time the case was recorded, was a just one, and that, as he suggested, something of the nature of acute swelling had taken place. In children an acute inflammation of the heart of this kind often takes place—pericardium, muscle, and endocardium, all are involved—the heart swells, rapidly enlarges, and the ventricular cavities dilate, and then there follows that contracted leaden consolidation of the bases of the lungs, a condition very common in children, which is neither simple collapse, nor simple œdema, nor simple pneumonia, but probably something of all these, and which is an excessively dangerous condition, because it is an indication of a sorely stricken heart.

The physical signs in such a case are not without interest. The heart's action is generally of great rapidity, the anterior wall of the chest will enlarge rapidly in the præcordial region—protruding, in fact, before an enlarged and enlarging heart—the pulmonary second sound will be loud, and the systolic sound at the apex will be replaced by a confused roar. Should there happen to be much effusion, the conditions will necessarily be modified thereby, and there will be increase of the præcordial dulness, particularly upward and rightward, and the impulse will become less violent and less diffused. It is but seldom that pericardial effusion causes either impulse or friction sound to disappear altogether.

Prognosis.—The prognosis and treatment of rheumatic peri- and endo-carditis may well be considered together; indeed, although endocarditis often occurs alone, it is hardly possible to consider rheumatic pericarditis apart from endocarditis, from which it is rarely separated. Acute peri- and endo-carditis, if they be attended with much turbulence and rapidity of action of the heart, or any evidence of consolidation of the lungs, require a guarded prognosis, based upon a careful study of the child and its surroundings. If, with the conditions just mentioned, the child be restless, unable to lie down, takes food badly, sleeps badly, and, above all, vomits, the condition is one of great danger. At the same time, it is hardly possible to avoid mistakes in forecasting the issue, seeing that some very bad cases rapidly improve, the consolidation of the lung and pleuritic effusion clearing up, and the heart's action quieting down; while others, no worse, perhaps, to all appearance not so bad as they, die off quickly, or after hovering for some days without improvement.

In chronic valvular disease, the opinion must be based upon the progress of the case. If the child take food well, and the heart's action become quieter, the impulse less diffused, the separate sounds more distinct, and the congested viscera less hampered, whilst it is able to take the recumbent posture when asleep at night, hopes may be entertained that it will ultimately reach a safe position—"safe but not sound," as Latham expresses it.

In simple dilatation, the prognosis must depend upon the extent of the dilatation and the evidence of impaired function which may be present. With close watching, the strictest rest, and the careful administration of digitalis, and such like remedies, some of these cases unquestionably recover.

The **treatment** presents no special features in children, but one may again insist that in acute cases dilatation of the heart takes place with readiness, and this we must be on the watch to prevent or remedy. Opium is one of the most valuable remedies for this purpose, and with children of this age, six to fourteen, it may be used freely—three or four grains of Dover's powder every four hours may be given. Belladonna is useful, combined with bromide or iodide of potassium, according as there is need for soothing turbulent action, or for procuring the absorption of inflammatory products. Then comes digitalis (F. 39) or the convallaria majalis, the former being much the more reliable in its action; and should there be much dropsy or scanty urine the tincture of strophanthus is a valuable remedy. Stimulants also are very necessary in some of these cases. A child of ten may have three or four ounces of wine a day, if by careful watching the conditions seem to improve under its use. If there be much pericarditis, counter-irritation to the præcordia may be kept up by a mustard-leaf or the linimentum iodi, and the chest wrapped round in a cotton-wool jacket. Absolute rest *must* be enforced for a long time, and, in the convalescing stage, iron and quinine should be administered for some weeks.

Absolute rest must be continued for a long time. It may be well to emphasise this. There is no more important rule of practice, and none that is more often neglected. The case has been one of acute peri- and endo-carditis, and the heart is smothered in a thick jacket of lymph, its muscular wall is swollen and degenerated, its cavity in all probability dilated. The subject is a child of ten or twelve years of age. Is a two or three months' recumbency longer than is necessary under such circumstances for the repair of so damaged an organ? Is it too much to insist upon, when the future of a just opening life depends upon it? The surgeon with the diseased join makes light of a year of rest; yet who has not seen a child after acute pericarditis skipping about at the end of a month or six weeks as if nothing had been amiss? This ought not to be; and in all cases, after rheumatic peri- and endo-carditis, the heart is to be rested in all possible ways for several months. There are many ways of accomplishing this; but chief of all, naturally, is the avoidance of all bodily exertion. Where it is possible, no walking, not even feet to the ground, should be allowed for three months. The child is to be carried everywhere; and when at last it is allowed to walk about, the pulse and heart's action should be carefully watched. We may remember, too, that the heart is rested also by sleep. I have already remarked that the beats of the heart are sometimes considerably reduced in number at this time. It may be rested also by diet and general attention to bowels, &c. The food must never be allowed to overload the stomach, or stimulate the circulation too much. Rest is also to be obtained by tonics, which help the cardiac muscle to contract and slow the action of the heart. Here it is that iron acts—it restores the nutrition of the muscle, and thus slows the action. Digitalis, acting in another way, accomplishes the same purpose, and thus allows the heart increase of rest by prolonging the pause. Strychnine, belladonna, convallaria, bromide of potassium, and hydrobromic acid are all useful, either in the same way or as sedatives in quieting the excessive action of the heart.

Non-Rheumatic Pericarditis: Suppurative Pericarditis.—Rheumatism is not the only cause of pericarditis in children, although it is by far the commonest. Infection of the pericardium with pyogenic micro-organisms may cause an acute pericarditis with turbidity or actual purulency of the pericardial fluid; such a condition is most often found in association with pneumococcal lesions, such as pneumonia, pleurisy, empyema, or suppurative meningitis. It is found also with those acute inflammations of bone which are not infrequent in childhood and adolescence, and which go by the name of "infective osteomyelitis." Such cases almost always suffer from abscesses in the heart, and as a natural consequence acute pericarditis follows, and should the patient live long enough pus collects in the sac. It may also be part of a general infection in the pyæmia.

which is seen in the new-born, originating in the umbilical sore.

Pericarditis may also be met with after scarlet fever (perhaps in some of these cases it is rheumatic), and as a sequel of acute Bright's disease.

A deposit of tubercle on the pericardium is by no means uncommon in children; we found it in 37 out of 269 tubercular children, but any general pericarditis of tubercular origin is rare, and when it occurs is usually of a chronic insidious type, which is hardly likely to be recognised clinically, although it tends to obliterate the pericardial cavity by adhesion. Another insidious form of pericarditis which is met with in children, and which obliterates the pericardial sac completely without producing any clinical symptoms, is that which is associated with poly-arthritis and enlargement of glands and spleen (*see* p. 683).

The acute variety of pericarditis which is due to pyogenic infection is far more frequent in infancy and very early childhood than in older children; of 28 cases * which we examined at the Children's Hospital, Great Ormond Street, 23 were under three years of age. It seems probable that most of these cases are the result of pneumococcal infection; in 24 out of the 28 cases mentioned there was also empyema, thick lymph on the pleura, or acute pleurisy, which, in most cases, had been preceded by a definite pneumonia.

Symptoms.—This condition is often overlooked in the general disturbance and the physical signs caused by the accompanying disease.

The symptoms which should suggest it are extreme illness out of proportion to the physical signs, with much anæmia often of an ominous grey colour, dyspnœa, which also does not correspond to the physical signs, and which is apt to show curious exacerbations without apparent cause, and rapidity of pulse. An increase of cardiac dulness, especially upwards and outwards beyond the left nipple, would support the diagnosis, but often the increase in cardiac dulness does not attract attention, for the amount of fluid in the pericardium is usually not very large; in the series of cases mentioned above, the largest amount was about five ounces, but now and then much larger effusions occur and may facilitate the diagnosis. The dulness caused by the accompanying empyema or pleurisy often obscures this increase of cardiac dulness.

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* "Suppurative Pericarditis in Children," *Brit. Med. Journ.*, Sept. 7, 1901.

Treatment.—Where there is reason to suspect from the associated conditions that the pericarditis is due to pyogenic infection, the pericardium should be explored either by a fine syringe, which may be introduced in the fifth left intercostal space about half an inch to the left of the sternum, or perhaps better, where circumstances make it possible to obtain the assistance of an experienced surgeon, by incision, with removal of portion of one intercostal cartilage, if necessary; in any case if pus should be found incision will be required. Too often such cases die without detection of the pericardial condition, but within the last few years the diagnosis and consequent operative treatment of suppurative pericarditis has been more successful. In the non-suppurative cases the treatment must be conducted on the same lines as in rheumatic pericarditis.

Malignant Endocarditis is not common in children. We have seen it, however, several times, and of fifty-four cases of malignant endocarditis recorded by Dr. F. Taylor, nine were under the age of fifteen years, one at three years of age. Six of these nine cases were girls.

This form of endocarditis in children supervenes most often on chronic valvular disease, the result of rheumatism or chorea; but it occurs also with pneumonia, and in one case under our notice it occurred with suppurative meningitis in an infant aged seven months. In its symptoms it presents no difference from the disease in adults. Cerebral complications are common; indeed, this is almost the only disease which gives rise to cerebral hæmorrhage in children. Infarcts in the spleen and kidney are usually present, and optic neuritis is not uncommon.

Malformations.—There are many varieties of malformation of the heart, or, as it is generally called, "congenital heart disease." There is patency of the foramen ovale, patency of the ductus arteriosus, deficiency of the septum of the ventricles, and stenosis of the aorta where the ductus arteriosus opens into it, just beyond the left subclavian artery. There are other anomalies, such as a single ventricle and auricle, one ventricle to the two auricles, or the viscera are transposed, the heart being placed on the right side of the chest and the liver and spleen transformed in correspondence; and, lastly, there are the various forms of adhesion and stenosis of the several valvular orifices, chiefly of the pulmonary artery and of the aorta, occasionally of the tricuspid and mitral also. But to give such a list as this is only to name the chief conditions. It will be quite unnecessary, however, to describe all these seriatim. Those malformations consisting of reduction in the number of the cavities are very rare, and generally destroy life quickly; the only one, practically, which is in any way common—and this, of course, not so in the sense that its occurrence bears any proportion to that of other diseases of the heart—is stenosis of the pulmonary artery, with which is usually combined a deficient septum between the ventricles. Next after these in frequency come a patent foramen ovale and a patent ductus arteriosus. And all these, while they may, and frequently do, occur independently, more often are found in company.

Malformations of the heart vary as, and are in great measure to be explained by a knowledge of, the stages of development of the fœtal circulation. In the earliest embryonic days the heart has no separate cavities; it subsequently divides into two, and later into the four of the mature fœtus. So with malformations; we may meet with one auricle and ventricle, the pulmonary and systemic vessels coming off from the ventricle in common. A little later, and there is the heart of three cavities, two auricles, and a ventricle. Gradually, as the imperfections of later development remain persistent, so there is found a heart with four cavities more or less complete, usually with some deficiency in the septum, if not of the auricle, still of the ventricle. The main vessels go wrong early: the pulmonary artery fails to develop, or its valves form a perforated cupola, or the conus arteriosus becomes contracted; the blood under these circumstances cannot pass easily to the ductus arteriosus by means of the pulmonary artery, and the more ready route, by the interventricular septum, is kept open, the pulmonary artery contracts, and the aorta becomes twisted towards the right ventricle. This is by far the commonest malformation—the pulmonary artery contracted, the interventricular septum open, and the aorta, arising, as it is said, either from the right ventricle or from both. And it is at once apparent why it should be so common; for, in addition to the complex process which necessarily takes place in the accurate adjustment of the valves, and in the formation of the vessels from the branchial arches, it is brought about by other conditions which interfere with the natural flow of the circulation at that time of life. For example, a premature closure of the ductus arteriosus will so obstruct the circulation along the pulmonary artery, that the blood will tend, as in the contractions at the ostium, to find a more ready outlet by means of a still imperfect septum. The premature closure and permanent patency of the foramen ovale or ductus arteriosus are usually amongst the malformations occurring during the later periods of fœtal life. These are, perhaps, less easy of explanation—the former particularly so. Of permanent patency it may be said, in the words of the late Dr. Peacock, whose masterly thoroughness has well-nigh exhausted the subject, "Under all circumstances, it is very generally associated with some obstruction at or near the pulmonic orifice."

To make the subject, however, more clear, let us with Dr. Peacock turn it round and trace the conditions of the heart from the more perfect to the rudimentary forms. He says: *

"If, during fœtal life, after the septum of the ventricles has been completely formed, the pulmonic orifice should become the seat of disease, rendering it incapable of transmitting the increased current of blood required to circulate through the lungs after birth, the foramen ovale may be prevented closing; and, if the obstruction take place at an earlier period, when the septum cordis is incomplete, a communication may be maintained between the two ventricles. The same cause may also determine the permanent patency of the ductus arteriosus; for if, during fœtal life, the pulmonary artery be much contracted, or wholly obliterated, the blood must be transmitted to the lungs through the aorta; and, unless the ductus arteriosus be itself obstructed that vessel will necessarily become the channel by which it is conveyed. Similar effects would result from obstruction in the course of the pulmonary artery or in the lungs, in the right ventricle, or at the right auriculo-ventricular aperture. So, also, obstruction at the left side of the heart, as at the left auriculo-ventricular aperture, or at the orifice or upper part of the aorta, would cause the current of blood to flow from the left auricle or ventricle into the right cavities, and thence, through

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* "On Malformation of the Human Heart," pp. 159–60.

the pulmonary artery and ductus arteriosus, into the aorta, and would equally determine the persistence of the foramen and duct, or of an opening in the ventricular septum. The pulmonary artery and aorta would indeed appear to be either capable of maintaining for a time both the pulmonic and systemic circulations; and the necessary effect of the one vessel having the twofold function to perform, would be to give rise to hypertrophy and dilatation of the cavities of the heart more directly connected with it, and to the atrophy and contraction of those which are thrown out of the course of the circulation."

"These effects of obstruction at the different apertures must vary according to the period of fœtal life at which the impediment occurs. If the pulmonary artery be obstructed before the complete division of the ventricles, the aorta may be connected with the right ventricle, and both the systemic and pulmonic circulation may be chiefly maintained by that cavity. If, on the other hand, the obstruction take place after the completion of the septum, the double circulation will be carried on by the left ventricle: in the former case the left ventricle, in the latter the right, becoming atrophied. The degree of obstruction may also influence the course of the circulation, and so affect the development of the heart. A slight impediment at or near the pulmonic orifice, while the growth of the septum cordis is in progress, will probably give rise to hypertrophy and dilatation of the right ventricle, and to the persistence of a small interventricular communication. More aggravated obstruction, on the contrary, may arrest the process of development, and throw the maintenance of the circulation on the left ventricle. The influence of obstruction at or near the pulmonic orifice, or in some other portion of the heart, in modifying or arresting the development of the organ, is thus far capable of demonstration; but it is probable that similar causes may equally give rise to the more extreme degrees of malformation, in which one or other cavity retains its primitive undivided condition. For if obstruction taking place during the growth of the septum be capable of preventing its complete development, it may be inferred that impediments occurring at a still earlier period may entirely arrest the formation of the septa, so as to cause the ventricle, or auricle, or both, to remain single, or to present only very rudimentary partitions. It cannot, indeed, be disputed that in some cases, more particularly when the arrest of development is extreme, no source of obstruction exists to which the defect can be assigned; but it must be borne in mind that the absence of any obvious impediment to the circulation, after a lapse of a considerable period, as in persons dying several years after birth, does not afford any proof that some obstruction may not have existed when the deviation from the natural conformation first commenced. On the contrary, as remarked by Dr. Chevers, the condition which at first sight appears least in accordance with the theory of obstruction—that in which the pulmonary orifice and artery are dilated—really affords evidence that some serious impediment must have existed in the lungs or elsewhere, though it may have entirely disappeared."

There are yet other malformations to be considered, not, however, of so much importance as diseases incidental to childhood, as for the questions they raise as regards the ætiology of valvular disease, and I shall therefore only mention them to awaken interest and watchfulness for their detection. The first and more important is slight congenital defect in the various valves, which, by making them work at a disadvantage, or inefficiently under increased strain, becomes an important source of disease in later life. Dr. Peacock was a strenuous advocate for disease having this origin, and his reasoning was based upon a very full inquiry into the facts for himself, and a perusal of published cases. There is, no doubt, much to be said in its favour: some intra-uterine endocarditis occurs, and slightly thickens one or other of the valves; adhesion between the flaps or cusps is thus produced, and in the ordinary course of wear and tear such defects become subsequently accentuated, and disease gradually progresses as its subject advances in years. There can be no doubt of the occasional existence of malformations, which, though slight, are sufficient to lay the train of permanent disease, and to this extent it must be allowed that an argument exists for the *occasional* occurrence of mitral stenosis of a congenital form. At the same time, it must be said that on the left side this condition is very uncommon, and on either side, in proportion as changes, other than the perfect fusion of the valves—chiefly of the pulmonary and aortic valves, in a dome-shaped cupola, which all allow to be of congenital origin—are called congenital, so it becomes difficult to be positive concerning the time at which they occur, mainly because a careful examination of acquired valvular disease, rheumatic and other, aortic or mitral, shows that adhesion of the valves, matting, and the more moderate degrees of fusion, can be traced in all stages as the result of endocarditis of extra-uterine life. So much, indeed, is this the case, that it is very difficult to say what is certainly congenital. Nevertheless, the student should bear this question in mind, and endeavour, not only to satisfy himself on the matter, but, if possible, elucidate it by careful examination of such cases of endocarditis in very early life as come before him.

I can only allude to one other condition—viz., the contraction of the aorta beyond the left subclavian artery. The aorta at this spot is more or less constricted, as if a string had been tied around it. Sometimes it is completely obliterated at this spot. The ductus arteriosus is sometimes patent. The chief interest of the condition lies in bearing it in remembrance and correctly diagnosing it. It is compatible with many years of existence. In two cases which have come under my own notice, one was a man aged twenty-seven, the other a man of thirty-seven years. It almost necessarily leads to hypertrophy of the left heart, and very probably to dilatation also; while, from the fact that the circulation has to be carried to the lower part of the trunk by the subclavian and other vessels at the root of the neck, the enlargement of the surface vessels may allow it to be recognised. I believe that I have twice or three times recognised it in adults and once in a youth, but never yet in children.

Symptoms.—The general symptoms of malformation of the heart are cyanosis, palpitation, and more or less impediment to the respiration; and they are generally present from birth onwards. But they may be altogether absent; they may occur only intermittingly, or they may be absent for some time, even years, and come on without any assignable reason as the child grows older. Such children are, however, usually ailing from birth; they are easily chilled, and subject to attacks of bronchitis.

As regards the local symptoms, bruits, &c., by which the particular malformation may be recognised, it can hardly be said that any are diagnostic. There may be no murmur even though the cyanosis is extreme, and when a bruit does exist, it is often so loud and harsh over the entire præcordia, that it is a matter of the greatest difficulty to localise it definitely. In looking over fifteen cases of which I have notes, I find that two are of transposition of the heart—once of the heart only; once of the heart and viscera. In both these a systolic bruit existed in the præcordial region, and to the right side, which is not unlikely to have been developed in connection with disease of the pulmonary artery. In five others the bruit was pulmonary or septal in position. In five there was an apex bruit, one accompanied by a thrill, in which it was hardly possible to arrive at any positive conclusion; in two, with much cyanosis and disturbed action, there was no bruit at all. In one there was a persistent humming-top bruit, which suggested a patent ductus arteriosus; and in one a loud systolic bruit, to the right of the spine more particularly, the nature of which was uncertain.

The chief point to remember is that the larger proportion of cases by far are contracted conditions of the pulmonary artery, combined with a patent septum ventriculorum; and, consequently, whatever the variations which the præcordial bruit may present, unless other indications allow of its exclusion, this malformation is in all probability present. Its proper characteristics, however, are a systolic bruit along the left border of the sternum from third to fifth rib; most intense in the mammary line, and running upwards to the left clavicle, but not along the aorta or towards the axilla. There may sometimes be a thrill over some part of the area occupied by the bruit. The præcordial dulness is usually extended laterally to the right, by reason of the dilatation of the right side. A patent foramen ovale, although occasionally associated with cyanosis without other malformation, has so frequently been found without symptoms of any kind, that it can be seldom diagnosed.

A patent ductus arteriosus can be but rarely capable of recognition. Walshe, from two published cases, thinks it a "matter of fair conjecture, that if a cyanotic adult (for which in this case we must read 'child') presented the signs of hypertrophy of the right heart, a negation of murmur at either apex of the heart, a single prolonged diastolic, or a double murmur, of maximum force at the pulmonary cartilage, and not conducted downwards, the cause of these combined conditions would be found in a patent state of the ductus arteriosus." I venture to doubt even so cautious a conclusion as this, because from a case which once came under my observation, it is certain that a dilated pulmonary artery is by itself a sufficient cause of a bruit of this kind; and both in Dr. Fagge's case, and that of Jaksch, from which Walshe draws his conclusion, the pulmonary artery was dilated. In the particular case I refer to, which came frequently under my notice, the peculiarity of the bruit (it was delayed systolic rather than diastolic, although it continued on beyond the systole into the diastole) consisted in its time and in a peculiar musical tone, and I went so far as to discuss not only the question of a patent ductus, but also that of a communication between the aorta and pulmonary artery, as the result of aneurism, and also of simple aortic aneurism. All of these seemed possible. A mere dilatation of the pulmonary artery had not occurred to me, but such the post-mortem examination proved the condition to be.

Now this may at first sight appear to be beside the question of congenital disease, because it is hardly a point which concerns the diseases of childhood; a patent ductus being a recognised condition, a simple dilatation of the pulmonary artery hardly so. But a little reflection will convince one that this view is a too limited one. It has always been a question of interest to those who have made a study of the diseases of the heart and lungs how far collapse of the lungs in early infancy and childhood may be conducive to actual disease, and it is obvious that in atelectasis there is a sufficient cause, not only of dilatation of the pulmonary artery, but of patency of the ductus, dilatation of the right side of the heart, and patency of the foramen ovale, did it but make itself felt a little prior to the time at which closure takes place in these apertures of communication between the two sides of the heart. We have, however, in atelectasis a cause of chronic valvular disease, if not of actual malformation, on the right side, which is probably of far more importance than that usually ascribed to it; and for this reason the physical signs of dilatation of the pulmonary artery are well worth the attention of the student.

Simple stenosis of the aorta may be easily recognised by a loud systolic bruit along the aorta, by a systolic thrill, and by a slow pulse. It is not a condition which comes often under notice in childhood. It would appear that, if it be congenital, the disease goes on for a long time, the left ventricle undergoing hypertrophy, and compensation being complete. After a time, however, at two or three and twenty years of age, dilatation begins, and then it is that these cases come for treatment.

Prognosis.—What is the duration of life in these cases is another question, which can only be answered in the most general terms. As a rule, all serious malformations cut life short early. The slighter forms, such as slight apertures in the foramen ovale or in the septum, are compatible, at any rate, with many years of existence. The risk to life is naturally in proportion to the derangement of the circulation; and, according to Dr. Peacock, the commoner forms of malformation rank in order as follows, commencing with the least dangerous:

Moderate contraction of the pulmonary artery.
Contraction of pulmonary artery and patent foramen ovale.
Contraction of the pulmonary artery, with imperfect septum.
Completely impervious pulmonary artery.
A single ventricle to one or two auricles.

While, however, all these bring life to a standstill within a few weeks or months in the great majority of cases, and those at the bottom of the list more speedily than those at the top, nevertheless there is no one of them which is not compatible with a life of many years. Therefore, for individuals, the prognosis must be somewhat guarded.

The causes of death are usually cerebral disturbance due to cyanosis, or deficient expansion and collapse of the lungs, with some intercurrent bronchitis.

Treatment.—This resolves itself into a few common-sense rules, which any one can suggest to himself. These children suffer from cold; they must therefore be well clothed, and in cold weather be kept as much as possible in one uniform temperature. This is the more necessary as the lungs are in a permanent state of engorgement and very liable to bronchitis, and sudden changes of temperature increase the risk. An attack of bronchial catarrh in any case of this kind may prove the last straw which brings the labouring circulation to a stop. Children with congenital heart disease are not uncommonly subject to outbursts of passion; these must be guarded against as much as possible. The diet must be carefully regulated down to simples in small quantities, at somewhat more frequent intervals than is the usual habit of children; and if the emaciation makes way, they must be fed with tonics, cod-liver oil, and maltine.

Cyanosis.—Two views have been held as to the cause of the extreme lividity that is so common a feature of congenital disease—one that it is due to the mixture of arterial and venous blood in the course of the circulation; the other that it is dependent upon the congestion which follows upon the obstruction of the pulmonary circulation. Of these two, the latter is without doubt the more generally correct, for these reasons chiefly, that it is not uncommon to find extreme cases of malformation with no cyanosis, or which are cyanotic only intermittingly; and also that simple pulmonary disease has been known to cause cyanosis as extreme as any malformation of the heart ever does, and that without any abnormal communication between the two sides of the heart. It is now, therefore, very usually taught that the cyanosis is due to the extreme obstruction in the lungs, and to the consequent retardation of venous blood in the cutaneous capillaries. But this is not the whole truth, for such a discoloration as is met with from congenital heart disease is very uncommon from any other cause. It is therefore probable that the dilatation of the cutaneous capillaries most commonly reaches a sufficient pitch only when the disease takes effect in earliest infancy; and it is not unlikely, also, that a certain thinning or delicacy of the skin is requisite to its full exhibition. Certain it is that, where the cyanosis is well marked, the skin is of a remarkably silky, almost greasy, softness.

Aneurism is not a common disease in childhood; but when it occurs—and it may do so even in any of the larger vessels, such as the carotid, or iliacs, or femorals—it is almost always associated with (many think due to) the plugging of the vessel from an embolus, dislodged from the valves of the heart and carried to the diseased spot. The history of such a case is, probably, this: an inflammatory clot from the valves is dislodged, and catching across the fork of a vessel, leads to clotting there, and then to inflammation of the coats of the artery; the artery thereupon softens and allows of dilatation under the pressure of the blood behind the plug, and an aneurism is formed. There is some doubt amongst pathologists about the exact mode of production of the aneurism, but of the fact, and of its association with embolism, there is no doubt. Aneurisms of this kind have been found in young people on the internal carotid, axillary, femoral and popliteal vessels, not to mention the cerebral arteries, which have often been affected; indeed, supposing that a young person should die with apoplexy, death is probably due to such an aneurism, which has ruptured after its formation. Occasionally, aneurism produced in this way has come under surgical treatment for the cure of the disease; but it is well to remember that the condition is an indication of the existence of the worst possible form of valvular affection; one usually associated with embolism, in many of the organs; and with hectic fever; it is nearly always fatal within a few weeks or, at the most, months; and there is seldom scope for treatment other than palliative.

CHAPTER LII.

INFANTILE SCURVY—PURPURA—HÆMOPHILIA.

Infantile Scurvy (Scurvy Rickets).—Scurvy, although an extremely rare condition in children beyond the period of infancy, is by no means an extreme rarity in infants, and under the name of Infantile Scurvy, or Scurvy Rickets, there is now well recognised a scorbutic affection chiefly of the bones, often associated with moderate rachitic changes. This condition was formerly known as "Acute Rickets," chiefly from the descriptions given of it by foreign writers who had no knowledge of its morbid anatomy. Dr. Cheadle, from cases which came under his own care, propounded the doctrine that the disease was a compound of rickets and scurvy. Dr. Gee has published cases, evidently of the same kind, under the name of "osteal or periosteal cachexia,"* and Sir Thomas Barlow, in the *Medico-Chirurgical Transactions*,† has considerably extended our knowledge of the subject by eleven additional cases, two of which are of the greatest possible value, for he was able, by a post-mortem examination, to demonstrate the actual nature of the lesion that existed. From these two cases, and another which had already been published in the *Transactions of the Pathological Society of London*, by Sir Thomas Smith, it is shown that the clinical features of infantile scurvy are associated, it is true, in most cases, with moderate rachitic changes, but much more with extensive subperiosteal hæmorrhage—chiefly of the femora and tibiæ, scapula, ribs, and cranium—and with a tendency to fracture, and sometimes to separation of the shaft from the epiphysis, as occurs in syphilis, acute necrosis, and, perhaps, other conditions also.

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* *St. Barth. Hosp. Reports*, vol. xvii. p. 9.

† Vol. lxvi. p. 159.

The name Scurvy Rickets is unfortunate as implying some essential connection between two entirely distinct diseases: there is no such connection between infantile scurvy and rickets; the most extreme cases of rickets may, and usually do, show no trace of infantile scurvy, and a well-marked case of infantile scurvy may show no rickets; moreover, when the two diseases are co-existent, the degree of the one bears no proportion to that of the other.

This is a point which is of considerable interest in its bearing on the exact ætiology of those two conditions. Diet is the chief factor in both; but it is clear that whatever may be the particular element which is at fault—and this has yet to be determined in both diseases—the fault in diet which produces rickets is not the fault which produces scurvy. A given diet may combine the two faults, and so produce the two diseases, and this undoubtedly is what usually happens.

Although it is at present uncertain what is the exact nature of the defect in diet which causes scurvy, some information may be gathered from the histories of the cases which come under observation. From these it is clear that the prevailing characteristic of the feeding is a deficiency of fresh milk. In our own experience the foods which had been given were chiefly one or other of the proprietary dried foods, mixed either with water alone or with a small quantity of milk which in almost all cases had been boiled: in other cases only condensed milk had been used, and in one case only sterilised milk mixed with barley-water and lime-water. Dr. Cheadle points out that peptonised milk is also a scurvy-producing food; and it is evident that the anti-scorbutic power even of fresh milk is slight, for where the diet otherwise favours the production of scurvy, a small quantity of fresh milk is not always sufficient to prevent it, and there can be little doubt that cooking the milk still further reduces its feeble anti-scorbutic properties.

The age at which infantile scurvy most often appears is, in our experience, between the sixth and the twelfth month: it occurs much less often in the second year.

We have seen one or two cases of scurvy in older children; but these are extremely rare, and perhaps come nearer to the adult type of scurvy. Sir Thomas Barlow has pointed out that in such cases a deficiency of the anti-scorbutic element in diet may be explained by a dislike to vegetables, which these children have manifested.

The clinical **symptoms** are given in the following case, which was sent to me by Mr. Oram, of Clapham :

A child of fifteen months. Its father is a dark man, and, Mr. Oram tells me, one of the most anæmic men he has ever seen. The mother is slim and small, but calls herself healthy. There is no rheumatic history. This is her first child. She nursed it for four months, and since then it has been fed on "milk food." "The child cannot take milk." For many weeks it has been subject to effusions of blood in the cellular tissue of the orbits. The effusion takes place quite suddenly, and perhaps before it is reabsorbed a fresh one occurs. For a month or two it has been quite unable to move its limbs. It was not an anæmic child in any marked degree. Its head was rather rachitic, the anterior fontanelle open; no craniotabes; no bosses on the skull. The two lower incisors only were cut; the gums were normal; no petechiæ. Both upper eyelids were swollen out by large effusions of blood, giving a black eye on each side, and the left eye was prominent in addition, apparently from effusion of blood into the orbit.

The child shrieked most painfully whenever it was touched, so that there was much difficulty in ascertaining where the most pain lay, but it was chiefly in the lower limbs. The radial ends were nodular, the ribs moderately beaded; the thighs and spine normal; the knees also. The lower half of each leg was swollen, brawny-looking and indurated; the dorsum of the foot was œdematous; the skin was pale and without any undue heat. It was impossible to be quite certain of any thickening of the bones, as the child's shrieks were terrible directly its legs were handled; but the indurated feeling of the integuments, and their peculiar adhesion to the bone, not unlike the sensation of scleroderma, made me sure that the bones were affected. The optic discs were healthy; the urine was not examined; the liver and spleen were normal.

Raw beef juice was ordered, underdone pounded meat, orange-juice and milk—the diet to be varied as much as possible—and opium was given in small doses three times a day. The child rapidly improved, and a month later it was free from pain, took its bath with pleasure, and moved its legs freely.

This case illustrates the typical features of the disease. There was plenty of evidence of a moderate degree of rickets; but the brawny tension of the lower limbs from the ankle upwards, and the extreme pain, were as certainly something more than rickets, and corresponded with what had been observed by Barlow to be associated with sub-periosteal hæmorrhage. Then there was the fact that the child was supposed not to be able to take milk, and its diet had been nearly confined to artificial food; at the same time there was no evidence of syphilis; the parents were moderately well-to-do; and the child rapidly improved by a simple change of diet, and by quieting its pain by the temporary administration of opium.

Of other symptoms I may mention that if any teeth are cut there is usually some slight swelling or lividity of the gums, and they are sometimes markedly spongy. The urine contains a small trace of albumen, or blood in a large proportion of the cases; less frequent but still by no means uncommon is pyuria; probably indicating some pyelitis. We have also found many cellular casts with much albumen in two cases, evidently pointing to an actual nephritis.* Occasionally some blood has been passed from the bowel.

There are cases, however, in which the symptoms are by no means so obvious; and it is most important that their existence should be realised. Many an infant with this disease has suffered needless pain for weeks because the nature of its illness was not recognised.

The only symptom may be tenderness about one or more of the limbs, usually the legs. The child is miserable and out of sorts, and each time it is moved it gives a cry of pain. Careful examination may fail to detect any swelling of the limb, or it may be that by such palpation as is possible, a little fulness is made out over the shaft of the bone. Sometimes in these doubtful cases a look at the gums will settle the diagnosis, but at other times the result of treatment is the only criterion: the rapid disappearance of the tenderness on anti-scorbutic diet will clear up the difficulty.

Sometimes the only evidence of the disease is slight hæmaturia.

Diagnosis.—It is, perhaps, most likely to be mistaken for syphilitic disease of the bones. This, as is well known, is liable to occur at the epiphysial junction, and to spread as a periostitis along the shaft of the bone, and it leads to abscess and to separation of the epiphysis from the shaft. The absence of any definite signs of syphilis, and the existence of rickets, with the history of bad feeding, might in most cases make us suspect the real nature of the affection; further, there is the purple spongy appearance of the gums; and it may also be added that the brawny induration running gradually up the shaft is not quite what we meet with in syphilis, nor is the extreme pain of these cases often found to such an extent in the syphilitic bone disease of infancy. Moreover, as Sir Thomas Barlow has pointed out, syphilitic disease occurs at an earlier age than does this affection. Again, there is often a vague sort of idea that the child has rheumatism. But we know nothing of rheumatism at this early age; and rickets, which is also described as a painful affection of the bones, gives no pain such as this must be. Therefore, if a baby of, say, a year old, begins to cry violently whenever it is disturbed, our first thought should be of scurvy and sub-periosteal hæmorrhage, and our first attention should be given to the behaviour of the child under a careful and tender handling of its various bones, particularly of the lower third of each tibia.

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* *Lancet*, November 1904.

A serious mistake which has repeatedly been made, is to regard the tender swelling over the bone as a deep abscess, with the unfortunate result that the swelling has been incised. If the likelihood of scurvy at that age be borne in mind, and the gums examined, such a mistake is less likely to occur.

The reverse and perhaps even more serious mistake has been made of mistaking the tenderness, swelling, and loss of movement in the limbs from acute epiphysitis with suppuration, for infantile scurvy.

We have known the tenderness of scurvy to suggest the early stage of infantile paralysis, but the onset is likely to be more gradual in scurvy, the duration of the tenderness longer and its degree more acute; but it is remarkable how complete the loss of power often is.

In any doubtful case the urine should be obtained, although with infants this may be a matter of some difficulty, and entail careful watching for an opportunity; the presence of blood in the urine, as an association with tenderness of limbs, makes the diagnosis of scurvy practically certain.

Prognosis.—If treated properly, and not already too exhausted, these cases will get well, though the process of recovery is sometimes tedious. As a rule some improvement, especially diminution of tenderness, is evident within three or four days after the anti-scorbutic diet is begun. If no improvement is seen by the end of a week the diagnosis should be questioned. Sometimes without any treatment at all they get temporarily better, but quickly relapse again, and every now and then an infant, though not apparently at the time in a very serious condition, will rapidly sink. I have seen this occur on three separate occasions after a long railway journey. The disease generally occurs in infants who have been liberally supplied with "infants' food." Most often, in my experience, the child has been brought up on condensed milk; but it will occur with any "food," even the best of them if it be given in disproportion to fresh milk. I have several times known it to occur when the milk was adequate in quantity, but when to every meal a free supply of food had been added, and I do not think I have ever seen it in a child at the breast.

Morbid Anatomy.—The most constant feature in the morbid anatomy of infantile scurvy is the presence of subperiosteal hæmorrhage; the amount of blood thus effused is sometimes considerable, so that the periosteum over a wide area is stripped completely off the bone, generally, in the case of the long bones, near the epiphysial junction. There is also sometimes hæmorrhage into the medulla of the shaft, and there would seem to be some absorption of the unduly vascular cancellous bone so that fracture easily occurs; in severe cases it is not uncommon for the neighbouring epiphysis of a long bone to be separated, so that the shaft hangs free in the blood-containing sac formed by the periosteum. The periosteum itself is vascular and thickened. Hæmorrhage into the adjoining muscles is also present in some cases, and in a severe case recently under the care of one of us, autopsy revealed, in addition to the changes mentioned, hæmorrhage into the knee-joint, a rare occurrence. Hæmorrhage may also be found in the subcutaneous tissue and more rarely in the viscera. With the lesions of scurvy there is usually combined a moderate degree of rickety alteration in the bones.

Treatment.—This resolves itself: first, into supplying the fresh element which has been lacking in the diet; orange juice or lemon juice, or, as Dr. Cheadle suggests, a powdery boiled or steamed potato beaten up into a thin cream with milk, any of these may be given in doses of half a teaspoonful three or four times a day, the last-mentioned being mixed with the food. If well taken, the dose may be increased in quantity or frequency. Raw meat juice is also of value, and if reliable milk can be obtained, this should be given unboiled. Secondly, the administration of small doses of opium sufficient to relieve the pain is, we think, decidedly beneficial, and after a little while some chemical food, Dusart's syrup or cod-liver oil, should be given to relieve the anæmia.

Last but not least, we would plead for gentle handling of these infants with scurvy rickets. To the student we would say: do not handle them at all unless it is absolutely necessary; the piteous cry of an infant with scurvy rickets when it is handled is the cry of real and acute pain. This must be impressed on those also who have to nurse the child: all movement is to be avoided as far as possible, and when necessary must be very gentle. It is a good plan to keep the weight of the bedclothes off the child by a cradle, and to leave the child in its nightdress until the tenderness has subsided; bathing also is to be done only with great discretion.

Purpura is by no means uncommon in children of the lower classes as the result of bad feeding or bad living. It may be met with in all degrees, from scattered petechiæ in the skin, of small size, and which might easily be mistaken for fleabites, or larger and more profusely spread, up to considerable extravasations into the subcutaneous tissue, or to bleeding from the nose, gums, stomach, bowels, and kidney. Purpura, when confined to the skin, is sometimes called "simple"; when affecting mucous membranes also, "purpura hæmorrhagica," or "morbus maculosus." Purpura is a condition which is found associated with many diseases, such as rickets, rheumatism, blood-poisoning of various septic kinds, or ulcerative forms of heart disease, and it is produced in some subjects artificially by the administration of drugs such as iodide of potassium. Many of these forms, however, are allocated to the distinct disease, and we have thus purpura rheumatica, the petechiæ of scarlatina and small-pox, and the purpura of heart disease. These are not generally included in the term "purpura," but only such cases as originate, often without fever, without any more definite cause than prolonged failure in nutrition, dietetic or other.

Even extreme cases of this kind are not uncommon, and they usually speedily get well upon proper diet. I have, however, met with two cases which were associated with fever, one of them with severe intestinal lesions also, which speedily proved fatal. The intestine was found in the latter case in a spongy, tufted condition, not unlike the gums as seen in bad cases of scurvy.

Hæmorrhage occasionally occurs about the fundus oculi in purpura. This lesion has of late been frequently described; but, so far as I know, it has no special importance attaching to it.

A girl, aged four, was admitted on July 31, 1877. She had been languid and fretful, suffering from stomatitis for three days, and two days before admission the body became covered with purple spots. The gums commenced to bleed on the morning of admission, and blood had also come from the right ear, from which for two years there had been an occasional discharge of pus. The child by nature was of a dark, sallow complexion, but had enjoyed good health. It had been noticed that since its birth any scratch or cut would bleed freely. The child had been well fed, was fond, and had had plenty, of vegetables. The mother was of dark complexion, and believed that she had had a similar attack when a child. The gums were much swollen, greyish-looking, and fungating. All parts of the body were covered with small petechiæ, but no bruises. The child lay feeble and exhausted, with a temperature of 99·8°, pulse 134, respiration 20. The urine was normal. The thoracic and abdominal viscera also. Gallic acid in six-grain doses was administered three times daily, and green vegetables, milk and beef-tea were ordered. The bleeding from the gums becoming serious, they were painted with tincture of perchloride of iron. She vomited blood twice only; passed none in the evacuations and none in the urine. The bleeding from the gums gradually ceased, the spots faded from the skin, and she left the hospital well, after about three weeks' stay.

During her illness the fundus oculi was examined for hæmorrhages, and on the right side, above and internal to the optic disc, and at some distance from its margin, a large dark round blotch was seen, with a haze over it, and a white margin surrounding it. Near it was a considerable-sized vessel. The appearances were those of hæmorrhage into the choroid, with either atrophy around it or the white margin of a displaced retina. Both discs were whitish, and the choroidal pigment was very unevenly distributed—some parts of the choroid looking white by contrast with others.

The child was seen again some months later, and, the pupils being dilated with atropine, the fundus was fully examined. No trace of the former hæmorrhage existed, and the uneven distribution of pigment so marked before was now hardly noticeable.

Seven cases of purpura that have been under my care in the Evelina Hospital have all been of the female sex.

Of the pathology of purpura nothing is known; the blood has been examined, without result; the blood-vessels also, with no decided bearing.

It is but seldom fatal, except it be associated with much fever, although, in severe cases, the amount of bleeding from nose, bowels, or kidney may give rise to some anxiety.

Treatment.—Rest in bed is necessary, if there be any severity about the attack; and to stay the bleeding some gallic acid may be given in glycerine or honey, or some turpentine in syrup; possibly, the tincture of hamamelis may be useful, as also chloride of calcium and adrenalin. The body should be kept cool, and ice may be applied, if necessary, to the head or spine or even placed in the rectum. Plenty of good milk should be given, and orange, lemon, or lime-juice, with green vegetable diet and underdone meat or beef-juice.

Henoch's Purpura.—Under this name are now usually described a group of cases in which abdominal symptoms are the prominent feature of the disease.

It occurs most often between the beginning of the second dentition and puberty, that is about six to fifteen years.

The first symptom is often colic more or less severe with vomiting, and the vomiting may be so persistent and violent as to suggest some intestinal obstruction.* These symptoms may have lasted several days before the nature of the disease is explained by the passage of blood from the bowel, and generally simultaneously the appearance of purpura on the limbs. The bowels are usually costive, though diarrhœa has been present in some cases. Some swelling of the joints has occurred sometimes. After a few days the colic and other symptoms subside and the child appears convalescent, but a few days later there is often a recurrence of all the symptoms and several such relapses may occur, so that the duration of the disease is several weeks.

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* In one such case that has come within my knowledge laparotomy was performed, and the mesentery was seen to be studded with petechiæ.

In one case, a girl of about nine years, in King's College Hospital, there was with these symptoms also an acute nephritis with much blood, and albumen, and many casts in the urine; this child eventually recovered, but Henoch has recorded a fatal result from this complication. As a rule these cases do well, but the likelihood of several recurrences within a few weeks must be remembered.

Treatment.—The child must be kept warm in bed. Henoch recommends the application of an ice-bag to the abdomen and the temporary use of iced-milk in feeding. He gives an emulsion of almond or other oil internally, and if the pain is severe, adds some opium. Iodide of potassium has also been found useful.

Purpura fulminans.—Under this name Henoch has described some very acute cases of purpura in children in whom extensive extravasation of blood into the skin occurred, so that the hands became of a purple colour, and in some cases serosanguineous bullæ appeared on the skin. Death occurred in twenty four hours, never later than the fourth day.

Somewhat similar cases have recently been recorded at the Pathological Society of London.* An infant suddenly becomes ill, purpuric spots or bullæ appear on the skin; delirium, convulsions, and hyperpyrexia are present in some of the cases, and death occurs on the second or third day of the disease. While, however, in Henoch's cases nothing was found post-mortem except anæmia of organs, in the cases to which we have referred the lesion which particularly attracted notice, and for which they were recorded, was hæmorrhage into one or both suprarenal capsules. No treatment seems to have been of any avail.

There is another group of cases in which suprarenal hæmorrhage assumes some importance in infants. Several cases have been recorded in which, during the first week after birth, infants have died somewhat suddenly with abdominal pain and collapse, and the autopsy has shown hæmorrhage into one or both suprarenals which have ruptured, allowing extravasation of blood into the surrounding tissues or into the peritoneal cavity.

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* *Path. Soc. Trans.*, vol. xlix.

Hæmophilia.—Purpura—the case above detailed in particular, with its history of a tendency to bleed to excess on slight scratches, &c.—leads naturally to the consideration of hæmophilia, or the hæmorrhagic diathesis. It is a disease which is strongly hereditary, and it is far more common in males than in females, the proportion being about eleven to one. As regards its transmission, there is this curious fact about it, that it passes to the males through the females, the mothers remaining quite healthy whilst passing on the disease to their sons; fathers who are bleeders but rarely transmitting it to their sons. The females in bleeder families, according to Dr. Wickham Legg, from whom I am condensing this account, are, unfortunately, remarkably fertile.

Treatment.—The subjects of hæmophilia differ in no appreciable respect from other people. They are usually healthy. The symptoms for the most part show themselves within the first year or two of life, and are characterised either by bleeding from the nose or mouth or spontaneous ecchymoses in the skin. In the extreme cases, found usually only in the males, the bleeding arises spontaneously, or from the most trivial causes, and occurs not only in the skin and from mucous surfaces but large extravasations take place into the subcutaneous tissue and intermuscular septa, and into the cavities of the larger joints. To this escape of blood into the joints is due the obstinate swellings of the joints, particularly of the knee, which characterise this disease.

Of the few cases that have come under my own notice, one was a boy, aged four, who had persistent epistaxis after some slight injury. Another, a boy, aged nine, with epistaxis to blanching, whose brother suffers also from frequent epistaxis. A third, a male, of eighteen months, I am uncertain about, from the possible existence of rickets. He had had convulsions, and his head was large; but he looked in perfect health, except that he was covered with painless lumps, of bruise-like appearance. In some of these the amount of extravasated blood was large. The whole body was dotted over with petechiæ. One sister had passed blood per anum, and had been in Guy's Hospital for hæmaturia. And another boy, who died at the age of twelve, was said to have had lumps much like those of this child. A fourth, a boy, aged five, bled profusely after the extraction of a tooth. Several others in the same family had suffered from the same thing, and there is a married sister, who always loses severely at her confinements, and whose catamenial flow lasts a fortnight out of every month. I have seen several marked cases of hæmophilia in girls, one of which proved fatal by hæmorrhage.

Pathology.—Nothing is known of the cause of this condition. The various viscera have been examined, and the blood also, but mostly without result.

Diagnosis.—This is not easy from purpura due to other causes. Attention must be paid to the history, and also to the family history and to the sex of the patient.

Prognosis.—The disease appears to be persistent throughout life, and there is naturally a risk of the occurrence of profuse hæmorrhage at any time. Nevertheless, if all due care be taken to avoid injury, the extraction of teeth, &c., and to keep in as good a state of health as possible, there is no reason why old age should not be attained. As regards the local affection of the joints, it is slow to depart, and is often associated with pain and fever.

Treatment.—Nothing can be said materially to influence the disease, but perchloride of iron appears to be the best remedy, and chloride of calicum may be tried (F. 45). Adrenalin, too, though a new remedy, seems decidedly worth trial. Preventive treatment is the more effective—viz., the avoidance of injury in any shape, warm clothes, residence in a warm climate, and good living. When hæmorrhage has been so severe as to threaten life, transfusion may be had recourse to. The joint affection must be treated upon general surgical principles, by rest, splints, &c., bearing in mind that the fluid within is blood, and, therefore, that, after the inflammation has subsided, gentle movement of the joint is advisable, to prevent the formation of adhesions.

CHAPTER LIII.

RICKETS AND BONE SOFTENING.

Rickets is one of those diseases for which familiarity often breeds a certain amount of contempt in the student's mind. "Only a case of rickets" is not infrequently his mental attitude in regard to it. It occurs so often, under conditions of home life which it may seem well-nigh hopeless to combat, amongst the poor, the ill-fed, the badly housed of our large towns. Nevertheless, it is a disease of much interest. That it is called Englische Krankheit may well make us study it thoroughly, and to a motive of this sort may be added that it is a cause of heavy infant mortality through bronchitis and its allies, whilst yet it is one of the most preventable of diseases.

Ætiology.—As with many another disease, so often as we come to discuss its causes, although the evidence in the main is unmistakable, there are yet subsidiary points which, whilst they are less certain, have sometimes, in the heat of controversy, been allowed to obscure the light we have. Rickets is a diet disease, due to the prolonged administration of indigestible, and for the most part of starchy, food. It has been said, indeed, that rickets can be produced at will by the copious admixture of starch with the milk at a time when the child is unable to digest it. It is hardly so. In the larger number of cases atrophy and the death of the child are brought about by bad feeding. In some, and these also very common, Nature, so to speak, saves the ship from wreck, and the child is left to drag along in the sadly dilapidated condition we know as "rickets." This much all will allow. It is only when we come to discuss the question as to what other influences are at work in the production of the disease that any uncertainty exists. But for my own part, in matters so difficult of solution, I doubt the necessity of their discussion. I have occasionally seen rachitic children who have been properly nursed by apparently healthy mothers, and who have also been under the best hygienic conditions. It must be admitted that a deteriorated condition of health on the part of the mother, either during gestation, or while suckling the infant, is only too likely to conduce towards—perhaps actually to produce—rickets, and perhaps a similar cause may account for the fact that rickets seems specially prone to occur in the later children of large families. I quite believe with Dr. Eustace Smith that unduly prolonged suckling makes for rickets. One can as readily admit—the burden of proof surely lies on him who would not do so—that bad air, ill-ventilated, ill-lighted rooms, want of cleanliness—the conditions of life that are met with in large towns—are potent abettors of the disease. And syphilis also, in that it produces a much impaired state of nutrition, which often extends over many months, may surely help in the same direction.

These are all questions which will have to be entertained in individual cases. These various elements of bad hygiene will then need to be very carefully appraised, and the directness of success in treatment will no doubt depend much upon whether this be done well or ill. But the general question involved is untouched by them; and rickets remains essentially a diet disease, unless, indeed, such a radical hypothesis be accepted as that of M. Parrot, that rickets is a manifestation of infantile syphilis.

I shall not discuss what may be the ætiological formula for rickets in Paris or other large Continental towns: it will be sufficient for my purpose to say that in England rickets, as a disease, exists for the most part independently of syphilis, and it is not appreciably ameliorated by mercurials or iodide of potassium.

The arguments in favour of its dietetic origin are shortly these. Changes in many respects like it are found in the lower animals kept in confinement and under artificial conditions as regards their food. It is a disease of all large towns, more or less—that is to say, in proportion as the population increases, overcrowding occurs, and the means of subsistence become more costly; then hand-feeding, and cheaper, less troublesome, less well-prepared, and less valuable foods are substituted for milk, and so we have rickets. Although called the "English disease," it is by no means confined to this country. It may be seen in most of the large Continental cities, and in some is as common as it is with us. Lastly, it is a disease found, to say the least, in overwhelmingly large proportions in hand-fed infants. Dr. Buchanan Baxter made some most careful inquiries on this point amongst the out-patients at the Evelina Hospital, and the result was that no less than 92 per cent. of the whole number had been given farinaceous food before the age of twelve months. The time of life at which the disease is met with forms an important element on this head, and I have analysed 141 of my own cases, to show this:

5 m.	7 m.	8 m.	9 m.	10 m.	11 m.	12 m.	18 m.	2 years	2½	3	3½	4	5	6	Total.
3	1	3	2	5	6	11	36	26	19	13	2	6	5	3	141

Sixty-eight were boys, seventy-three girls.

Dr. Gee* gives much larger numbers than these. Of 635 cases (365 boys, 270 girls), 32 were under six months, 144 from six to twelve months, 183 from twelve to eighteen months, 133 between eighteen months and two years, 116 in the third year, and 27 in the fourth year. And he further states that 30 per cent. of sick children under two years of age are rickety.

This table only gives the age at which the child was brought for treatment. In most cases the onset of the disease must have ante-dated the attendance by a considerable period. But it shows well how large a proportion of cases occur from ten months to two and a half years—that is to say, from weaning onwards through the period of dentition.

It may be added here that some authors have contended for the existence (1) of fœtal rickets, (2) of rickets at birth (congenital rickets), (3) of the rickets at the time of life here spoken of, (4) of late rickets. There is reason to believe that fœtal and congenital rickets do occasionally occur, but with extreme rarity. These must not, however, be confused with achondroplasia, a different condition to which we shall refer below. All agree that rickets is rare during the first two or three months of life.

I have stated the case thus far somewhat dogmatically; but it must be borne in mind that there is no single fact in connection with rickets which has not been at some time or another, and which is not now, disputed by this authority or that. There are some who think the disease a diathetic one—one, that is to say, passed on from parent to child, in large measure independent of, and incapable of production by, external agencies alone. And some observations of Ritter von Rittershain show that rickety children frequently come of mothers who still bear traces of having suffered from a similar disease. It is also said, and the same author to some extent countenances this view, that tubercle is associated with rickets. Trousseau held that the two were mutually exclusive. But there can be no doubt that tuberculosis is not uncommon as a sequel to rickets, although, as Hillier says, the two conditions seldom go on actively at one time.

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* "On Rickets," *St. Barth. Hosp. Rep.*, vol. iv. p. 69.

Others hold as I have done, that it is dietetic; others, still more rigorously, that it is not only dietetic in a general way, but due to the administration of starch in particular: Dr. Cheadle has brought forward strong evidence that deficiency of fat in the diet is an important factor; others, again, lay stress on feeble health in the mother during gestation or lactation; others upon bad air, want of light, insufficient clothing, want of cleanliness, &c., and so on. Arguments quite worthy of consideration have been used for and against all these hypotheses by observers, of whom it will be enough to say that their names include some of the brightest ornaments of medicine and pathology in this and other countries. But upon a reflective study of much that has been written, the short summary I have given seems to me a fair and reasonable one; although I should not wish the student to suppose that it could not be dissected, and arguments advanced against some of the conclusions arrived at.

Symptoms.—Rickets is, for the most part, a slowly progressing general change in the tissues and the viscera, which runs an insidious apyrexial course. In the earlier stages of the disease the symptoms are somewhat vague. Diarrhœa, restlessness during sleep, and a tendency to throw off the bedclothes; profuse sweating of the head, neck, and chest; causeless crying when the child is moved, and a flabby condition of the muscles of the arms and legs, often combined with an excessive plumpness of the subcutaneous fat, are amongst those which at first are the most noticeable. Later on, the ribs become beaded, the wrists, knees, and ankles enlarge (Dr. Marshall has even noticed the knuckles affected), the shape of the head becomes characteristic, the nervous system irritable, and, in the latest stage, the child wastes, the ribs fall in, the spine and long bones curve, the liver and spleen become enlarged, and death may happen from bronchitis, broncho-pneumonia, or convulsions. But the symptoms must be considered in rather more detail.

The **head of rickets** is often characteristic; the veins upon the forehead stand out full of blood; the fontanelle bulges and is unduly open; the head is elongated from back to front, and its posterior segment enlarged. The head appears flattened in the temporal region, and the forehead, although overhanging, is not expanded, the general form being square. Thus, in several points, it differs from the hydrocephalic skull, which tends to assume a globular shape, the temporal fossæ bulging in place of flattening, the forehead being expanded, and the frontal bone opening gently upwards to the distended and prominent anterior fontanelle. Rickets may be combined with hydrocephalus; but, apart from this, the rachitic skull is laterally compressed, with prominences in the region of each frontal and parietal eminence. The cause of this has been much discussed, some attribute it to the fact that the child lies much on its back. By thus subjecting the occipital bone to pressure, the posterior part of the skull becomes flattened, and the brain is pressed forwards against the frontal bone. This may be in a measure true, but it is also to be remembered that rickets is a disease which begins comparatively late—not till some months after birth—and therefore not until the centres of ossification in the skull have had a fair start. The regions of the frontal and parietal eminences are then comparatively well protected, and the growth of the brain will go on with less difficulty by lengthening the skull from before backwards, and also by pushing outwards as a whole the lateral halves of the skull-cap. Moreover, the inter-frontal suture unites before the end of the first year, and, should the rickety condition supervene at a later date—as is probably not uncommon—the growth of the brain will then more readily proceed *backwards*, and by widening out of the parietal eminences, a head with a small square forehead and large posterior segment would be produced—the shape, in fact, which is a characteristic of the skull in many a case of rickets.

I cannot forbear to add that the brain is not exempt from laws which apply to other parts, and that—like the foot of the Chinese lady, which takes its shape from the appointed boot—it grows best along the lines of least resistance. Can anything of greater significance be suggested, where convulsions of varied kind form one of the chief features of the disease? It can hardly be a matter of indifference whether the growth of the brain is allowed to proceed as it should do, or whether by an early closure, say of the frontal or sagittal suture, the posterior parts are made to develop in disproportion to the front, or some part of the latter is placed under disadvantage. The size of the skull has usually been said to be increased in rickets, but Ritter von Rittershain, on the ground of careful comparative measurements, denies that there is any enlargement. The head often *appears* to be large, but this is due to the peaky face, the stunted limbs, and bad nutrition. Trousseau taught that the large skull went with precocity; but if the skull be not really enlarged, that contention falls to the ground; and if it be, the precocity is of a very shallow kind in most cases—it is more true to hold, with Dr. Gee, that the brain is usually dwarfed. Sir W. Jenner ascribes the prominent forehead to infiltration of the anterior lobes of the brain with albuminoid material; others would say to hypertrophy of the brain. This must, however, be a rare condition, whereas the prominence of the forehead is a very common feature of the disease. I believe the explanation I have given, that the brain pushes the segments of the skull backwards and forwards, is more satisfactory for the majority of cases; while in some it is accounted for by an exuberant growth of soft bone on the frontal eminences.

Hydrocephalus is said by some to be a frequent associate of rickets. There is, however, but little evidence that this is so. The fontanelle may remain widely open long after the period when its closure should be complete (this is given by Dr. Eustace Smith as the end of the second year, but in healthy children very little of a fontanelle should remain after the end of the first year), and it may bulge unduly, and frequently does so in rickets, but these things do not necessarily mean hydrocephalus. At the same time it cannot be said that there is any cogent reason against the onset of this disease, for any delayed ossification of the skull would to some extent seem to invite the occurrence of a congested brain, or of hydrocephalus, as Dr. Dickinson has insisted.*

Craniotabes, first described by Elsässer in 1843, has till lately always been held to be a sign of rickets. M. Parrot and others have called this doctrine in question, and consider the complaint a sign, not of rickets, but of congenital syphilis. Craniotabes, or wasting of the skull, is a condition of softening of the bones, particularly of the postero-parietal region by which, under moderate pressure from the finger, the bone caves inward with a crackle like that of stiff parchment. It is of two kinds: in very young infants the bones of the skull will yield under pressure and sometimes crackle, but this is not a diseased condition. The true disease generally exists in localised patches. It is said to occur in 30 to 40 per cent. of all cases of rickets and is found to perfection from six months after birth onwards. It is an open question how far this condition is due to uncomplicated rickets, and how far to syphilis; but it is a remarkable fact that, since the question was mooted, some very weighty evidence has been produced in favour of its association more with syphilis than with rickets. Barlow and Lees collected 100 cases of craniotabes, and have published † the results of a most careful inquiry upon its relationship both to syphilis and rickets. From it they conclude that 47 per cent. of the total are almost certainly syphilitic; and to this may be added the observation of Dr. Baxter,‡ that of the 23 per cent. of craniotabes in rachitic children, 75 per cent. were syphilitic. My own opinion inclines in the same direction. For a long time I examined for craniotabes amongst rachitic children, and finding it so seldom, I was disposed to think it was far less common than has been taught; but then, being engaged at the time on other observations upon congenital syphilis, all such as showed any traces or suspicion of that disease, even if associated with rickets, were, no doubt, passed into the syphilitic group, and thus would have escaped notice. Certainly in such cases as I have known in recent years, craniotabes has most often gone either with well-marked congenital syphilis, or occurred where the suspicion of the existence of that disease was strong; but there is still a proportion of cases in which no such taint can be shown to exist, and I should suppose it to be one of those conditions for which a combination of circumstances, if not necessary, at least is most favourable to its production.

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* "Lectures on Chronic Hydrocephalus," *Lancet*, 1870, vol. ii.

† *Path. Soc. Trans.*, vol. xxxii. p. 323, *et seq.* ‡ *Ibid.* p. 361.

In this regard it is important to remark that experienced observers state that craniotabes is almost invariably associated with laryngismus. Now laryngismus is universally admitted to be almost always due to rickets. I do not know that any one has asserted it to be due to syphilis; so that, if the two are thus closely associated, the fact is clearly in favour of the rachitic nature of craniotabes. Dr. George Carpenter has quite recently and independently gone over the ground again. He finds it difficult to decide whether the affection is due to one or the other, although he inclines to syphilis as being the more important factor; but he practically adopts the conclusion I have come to in the text, that both diseases combine to favour its production.

The skull of a child affected with craniotabes shows shallow depressions at the diseased parts, smoothly bevelled off into the surrounding bone. The depressed areas may be so numerous as to give the inner table a somewhat trabeculated appearance. The thin layer of bone which covers in the depression is that which gives the crackle as it bends inwards on pressure. In some cases the thinning is more general, involving, perhaps, the entire occipital bone; in others, the local thinning is considerable, and may go on to the formation of a number of membranous opercula. In other cases, again—and the real nature of such is still open to question—there is much tendency, not only to thinning and softening, but to the formation of new bone, in most cases leading to the production of a velvet pile-like layer of osteophyte over the surface of the calvaria between the sutures and the centres of ossification. In this way the sutures come to form furrows, and the shape of a hot cross bun is produced—the *natiform* skull—and sometimes the bone formation may be so active that the skull may reach a thickness of half an inch or more. The new bone is very soft in all these cases, can be cut with a knife, and is of a peculiar claret colour, from the amount of blood it contains.

Epiphysial Lesions.—Other signs of rickets are found in the epiphysial extremities of the long bones and in the ribs. In these the ossifying layer of cartilage at the junction of the epiphysis with the shaft, or in the case of the ribs at the junction of the costal cartilage with the bone, becomes swollen—sometimes enormously so—and thus is produced a characteristic swelling of wrists and ankles and a beading of the ribs. The symptoms, although present in most cases, are by no means remarkable in many. A child may be very rachitic as regards its head and dentition, and perhaps show a distorted thorax, enlargement of the spleen, and even curvature of its bones, whilst yet there is but little enlargement either of the ends of the ribs or of radius or tibia.

The bones are soft in rickets, and thus come sundry characteristic distortions of spine, thorax, pelvis, and long bones. In the thorax a double curve is assumed, the ribs fall in at their junction with the costal cartilages, and a vertical depression of considerable extent is produced in such parts of the thorax as are not supported by the solid viscera. The abdominal viscera prevent the falling in of the lower part of the chest; the lateral parts of the upper segment fall in considerably; whilst the sternum becomes rounded and prominent, and the antero-posterior diameter of the chest becomes the dominant one. Some have distinguished between this, the chest of the rickety child, and the distortion due to other causes, such as atelectasis, or non-expansion of the lung. In the latter the ribs yield generally from their angles forwards, and the transverse section of the chest becomes of a peg-top or angular shape, from the sternum becoming carinated. I must confess, however, to having had much difficulty in thus separating two distinct classes of cases. On *à priori* grounds it may be argued that the softened bone curves, not only at the epiphyses, but also generally in its length; there is ample evidence that it actually does so; and there seems little reason why the ribs should not thus yield. The worse the rachitic condition, so much the more yielding will there be, and the lateral grooves will then be pronounced. In the less severe cases the recession of the chest-wall will be less, and the chest will approach the angular type. Moreover, I am by no means sure that this shape does not represent a partial obliteration of the more marked distortions. It is much more common in children of six, eight, or ten years. The grooved chest is the common type of infancy. It is certain that, as the child grows and the bones harden, the deeper dip of the ribs at the costo-chondral articulations gradually expands again; while the antero-posterior expansion of the lung has become in a measure permanent, and tends to perpetuate the prominence of the sternum. Of the pelvis I would speak in the same way. That of mollities is beaked, or Y-shaped; of rickets, contracted in its antero-posterior capacity by the sacral promontory being unduly prominent. But in extreme cases of rickets, when the body weight has been unduly thrown upon the pelvis, the acetabula may be forced backwards into the pelvis, and a beak be produced by the symphysis and pubic bones. The femora and tibiæ bow outwards and forwards; the radius and ulna curve outwards; and in extreme cases the natural curves of the clavicles become much exaggerated. These conditions go with (sometimes they may be replaced by) an unnatural relaxation of the ligaments, particularly at the knees, and thus cause the knock-knees and bandy-legs that are so often seen in late cases of rickets.

A good deal of discussion has been carried on as regards the cause of all these deformities. Some have contended for muscular force acting on soft bones; others for simple weight—the bones, not being strong enough, yield under the weight they are called to support. Both these forces are probably entitled to some consideration; but the theory which attributes the curvatures to undue weight is no doubt the more important, and most of them may be understood and explained by a consideration of the direction in which the force has acted. In one case it may be the weight of the body in walking; in another, that of one part of the limb upon the remainder, in certain recumbent postures. In the arms it is due to those parts being used as a help to progression, the child moving on all-fours. In the thorax some have attributed the distortion to a combination of softening of the bones with collapse of the lungs, which is a frequent associate and consequence of rickets; others to softening of the bone, and a yielding under the inspiratory pull of the muscles. Of this, however, there can be no doubt, that the disease in the thorax is almost constantly associated with bronchitis and atelectasis, and that in the bones of the spine and extremities curvatures never reach any extreme form in such as have not been allowed to walk or sit up unduly.

Another important point as regards the rachitic skeleton is that the bones are stunted in their growth, and in extreme cases the child may be severely dwarfed by this means.

Muscular Symptoms.—A striking feature in some cases of rickets is the muscular feebleness, which may, indeed, be so great that the child is unable to raise itself into the sitting position: in most cases the muscles feel lax and flabby, and to this cause in part no doubt are referable, some of the deformities of rickets, such as kyphosis, scoliosis, and rickety knock-knee and talipes. Whether this weakness is due to structural change in the muscles is still uncertain, but microscopic changes such as blurring of striation and fatty infiltration have been recorded.

The muscles all over the body sometimes appear to be painful; not only the muscles of the extremities, but those also of the back and abdomen. Pressure is painful to these children, and they will often cry bitterly whenever they are moved. This condition may be present even before the changes in the bones are at all prominent. Some children are described as screaming whenever any attempt is made to move them; but I am inclined to think that in such there is likely to be some periosteal lesion, such as is described on p. 709 as a combination of rickets and scurvy.

Nervous Symptoms.—Convulsions, tetany, and laryngismus are in a very large number of cases associated with rickets. Indeed, so commonly is this the case that laryngismus particularly is thought by many to be always rachitic. All these affections are described elsewhere—convulsions and tetany as diseases of the nervous system, pp. 608, 613 *et seq.*, and laryngismus under the head of Laryngeal Spasm, p. 313 *et seq.* Nerve irritability also, or "facial irritability" is mostly associated with rickets in young children; the method of detecting it has already been described (p. 614): it is a valuable indication of a convulsive tendency. The irritability of the nervous system in rickets is often shown by other slighter manifestations, such as head banging or head rolling. The child will beat its head with its fists, or knock it against the floor or the side of the cot, or will roll its head monotonously from side to side on the pillow, so that the hair is rubbed away almost entirely in some cases from the back of the head. No doubt these movements are usually dependent upon some local irritation, such as teething or middle-ear catarrh, but they occur mostly in the child whose nervous system is rendered unduly excitable by rickets. The close connection between spasmus nutans and rickets has already been mentioned (p. 597).

Zonular cataract, where some of the strata of the lens between the nucleus and the cortex become opaque, leaving the margin and central part clear, is a liability which attaches to infantile convulsions, and therefore to rickets. Why this is so we know not.

Glandular Symptoms.—The lymphatic glands all over the body become slightly enlarged and assume a shotty feeling in rickets, and, although this cannot be said to be common if we compute the entire number of rachitic children, they, or an enlarged spleen and anæmia, should always direct our attention to the possibility of the existence of rickets.

Dental Symptoms.—Dentition is much delayed in rickets. A child of two years old may, perhaps, have no more of the milk-teeth than the incisors and a molar or two, and these all more or less decayed. Delayed dentition is a valuable sign of the more moderate forms of rickets, which might otherwise pass unnoticed. The teeth are probably more apt to decay, and break away down to the gum, where they appear as black jagged stumps. This condition is not peculiar to rickets; it in all probability occurs as the result of any severe or prolonged state of ill-health in infancy, and of the prolonged administration of deleterious drugs such as mercury.*

Blood.—Anæmia, which sometimes reaches a very profound degree, is not uncommon in rickets; and in some of these cases the chief alteration is a great deficiency of hæmoglobin, so that the blood approximates in character to the chlorosis of later life. A differential leucocyte count shows no characteristic change.

The **urine** is said to contain too little urea and uric acid, and an increase of the earthy phosphates; though this statement has been called in question by Rehn and Seemann.

Complications.—These are chiefly two—bronchitis with atelectasis and diarrhœa. The occurrence of bronchitis is readily explained by the softened ribs and the distorted chest;

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* "The Diseases of Children's Teeth," by R. Denison Pedley.

these entail atelectasis and emphysema, which in turn lead to bronchitis; the disease in the tubes, by still more preventing the ingress and egress of air, increases the amount of collapse, and the increasing collapse tends to aggravate the catarrh, and the collection of a muco-purulent secretion in the tubes. The causes of the diarrhœa can be less precisely stated; but in an unhealthy child, with unhealthy secretions, congested viscera, diseased lymphatic glands, and severe disease of the bones—which are, at this time of life, most important elaborating organs for maintaining the blood at a normal standard—the existence of diarrhœa is at any rate no cause for surprise.

The association of rickets with scurvy, the so-called scurvy-rickets has been alluded to in the last chapter, p. 709.

Morbid Anatomy.—If we take the epiphysial end of a moderately rickety bone—of the rib, for example—and make a section through the length of it and its adjacent cartilage, comparatively healthy bone is seen on the one side, healthy cartilage on the other, and between the two a layer, more or less thick, according to the severity of the disease, of bluish or pearl-grey translucent cartilage. The line of this towards the cartilage is regular, but streaked with large vascular lines; towards the bone it is regular, and sometimes so much so as to intersect the bone immediately adjacent, and to appear as islands of cartilage, with vascular and calcareous points scattered about. On further examination, the adjacent layer of bone is seen to be paler or yellower than normal, and more rarefied. The superficial layer of the periosteum is unaffected—it can be peeled off the bone beneath, leaving a continuous surface; but beneath it, on the bone adjacent to the cartilage, there is more or less of a vascular soft material, prolonged upon it for a short distance, and imperceptibly lost as the cartilage is distanced.

The pearly layer of swollen cartilage causes the *beading* of the ribs and the enlargement of the ends of the long bones so well known in rickets; and as regards the former, it is always more marked on the pleural aspects, because the thoracic walls bend inwards at this point, and make a knuckle towards the lung. The bone elsewhere is softer and more rarefied than usual, and the fatty appearance of the medulla is replaced by one of a more vascular sort.

Under the microscope, an excessive activity of the cartilage, is observed, the cartilage cells become swollen and largely increased in number; but instead of making good bone, a process of calcification goes on in them, and the interstices between them become filled with a vascular marrow instead of with natural bone. These medullary spaces are continuous with the channels in the shaft, and thus is formed a spongy tissue, very vascular but with little bone in it. A similar process goes on in the vascular tissue under the periosteum; osteoblasts may be seen in all parts, but there is little bone.

The essential features of the bone-changes in rickets, therefore, are excessive activity of growth of that cartilage which makes for bone, and the production of a large quantity of vascular embryonic tissue, or medulla. It can then be readily understood that, so soon as the rachitic condition—whatever it may be—is neutralised, all things are in favour of rapid ossification. This is what actually happens in many cases: the epiphysial lines ossify so quickly that the growth of the bone is curtailed by the perfection of the repair, and thus bygone rickets is likely to be represented by a stunted but unusually hard and ivory-like bone. As I have elsewhere implied, the rachitic process is either not always of the same intensity, or it varies somewhat in different regions; and in the skull and spine there would seem at all times to be a probability of the production of more growth than in other parts, although still a soft spongy bone of indifferent quality. As regards the process of repair in these regions, it is difficult to speak; but from the not uncommon occurrence in adults of dense ivory-like skulls, and spines with eburnated surfaces, which want an explanation, it is possible that a similar course is pursued, in at least some, to that which goes on in the bones of the extremities.

From what has been said, it follows that there must be a considerable alteration in the chemical constituents of rickety bones, and analyses show a considerable deficiency of the earthy salts.

Of other morbid appearances found in rickets not much need be said, as they are described in other places in this book—not much *can* be said, so little is known about them. Changes in the brain have been described, such as the albuminoid disease and chronic cerebritis. Both conditions must be very rare. Of hydrocephalus, again—except as following upon convulsions and some organic disease, and possibly in this way dependent upon rickets—I think the frequency must have been deduced from such clinical features as distension of the fontanelle and fulness of the vessels of the scalp. But the meaning of these symptoms alone in any case is decidedly equivocal, as I have attempted to show in dealing with hydrocephalus.

The lymphatic glands undergo some change, probably of a fibroid nature, and reveal this by an indurated, scarcely enlarged condition. It is supposed, though without adequate proof, that this change is of a similar nature to that which the spleen and liver undergo. The albuminoid disease of all the viscera has been described as a glue-like change peculiar to this disease; but the observations of Dr. Dickinson and others, already quoted in chap. xxxi., make it clear that the actual change—and it is more common by far in spleen than liver, and, I think, than in lymphatic glands—is an increase in the fibroid material which constitutes the connective tissue of the organs, and it differs in no respect from that of the chronic enlargement of the viscera met with sometimes in ague, &c. The disease of the spleen, commoner though it is than that of the liver, cannot be called common. At most I have only notes of forty-four cases, and in twenty-four of these the rachitic nature of the general ailment was doubtful. It would seem, therefore, that it can hardly be an essential of rickets, and probably Dr. Gee is correct in considering it due to some pre-existing conditions, which, perhaps, it shares in common with rickets.

The condition of the blood in rickets has received but little attention. Chemically, it has practically received none. It is stated that there is no diminution of the normal alkalinity of the blood (Stoeltzner). I have made numerous microscopic observations of the blood of rachitic children, and the changes are certainly remarkable. In some there is a simple deficiency of corpuscles; in some a deficiency of colouring-matter; in some the blood is crowded with a granular detritus; and in others the corpuscles are represented by four or five different sizes. We are surely justified in assuming that these appearances indicate immaturity, poverty, and increased waste of the blood, when such are the exact conditions we should expect from what we know of the surroundings amongst which rickets finds its home. These *must* produce an inferior quality of the circulating fluids, and an inferior quality of blood will produce a deteriorated bone;

the converse also holds true—bad bone will make bad blood, and the lymphatic glands and spleen are therefore doubly likely to suffer from chronic changes of the kind that are known to keep company with blood diseases.

Such being the morbid anatomy of rickets, what opinion can be arrived at concerning its pathology? In this regard, one point in the histology of the disease seems to me to be pre-eminent—that the departure from the normal is one of perverted development. It is a *disease* only in so far as the material formed is not the best suited to the requirements of the body. This is important, for some pathologists are inclined to put all soft bones into one category. For such, rickets, mollities ossium, and the senile fragility of bone, which is not uncommon, are all related to each other; differing chiefly in the age of the affected person—for whom, perhaps, the missing link to bridge the two periods of life may be found in what has been called "late rickets." Surely this is disproved by a study of their morbid anatomy. Rickets is clearly an arrest of development; mollities is a degeneration of formed material. There can be no question that there is *some* truth in the assertion that rickets can be produced by feeding an infant on starchy food before it can digest it. No known condition of bad feeding will produce mollities ossium; diet a case of osteitis deformans how we will, no impression is made upon the disease, and both it and mollities are as yet quite beyond our knowledge and our power.

Many suggestions have been offered as to the cause of defective bone-formation in rickets. Perhaps the most favourite one has been that an excess of lactic acid exists in the blood. Experiments were conducted upon animals by feeding them on phosphorus, while phosphate of lime was withheld from their food. This treatment produced changes in the bones, supposed to be identical with rickets; the phosphorus was thought to have acted as a stimulant to the would-be bone, which was thus compelled to make bricks without straw. It is suggested that lactic acid, formed in the alimentary canal from milk and other food, may act in the same way, the materials for proper bone being wanting. But no excess of lactic acid in the blood has ever been found. On the contrary, the latest observations make its presence extremely doubtful, and the cause of the disease has by some been maintained to be a deficiency of hydrochloric acid. The intimate pathology of rickets is still unknown. But if we dismiss the question, how the softening of bone is effected, there are facts in the disease which are remarkably suggestive in attempting to frame a pathological conception of the conditions which determine it; and chief of these is the most remarkable fact, that rickets, *quâ* rickets, invariably recovers if treated properly—that is, essentially, if the child be put upon a proper diet. There is, perhaps, no other argument of equal force in favour of the disease being due to something which is withheld—in favour, that is, of the disease being dietetic.

Diagnosis.—When the bone changes are moderate the disease is frequently overlooked, and passes for mere backwardness, weakness, &c. Rickety children are often plump in the earlier stages; afterwards they become flabby and wasted. Apart from such general considerations as these, two or three errors in particular have to be avoided. One of mistaking inflammatory and sanguineous effusions beneath the periosteum for simple rickets, as has no doubt frequently been done under the name of "acute rickets" (*see* p. 711 *et seq.*). Another, of confounding the bone-changes of congenital syphilis for those of rickets. And, lastly, many children are brought for paralysis, with inability to walk and dangling legs, in whom the whole disease is rickets. There may, indeed, be a greenstick fracture due to this cause; but apart from this, the pain and wasting of the muscles will produce a very complete inability to move the limbs, which may sometimes deceive an incautious or inexperienced observer. Bearing the fact in mind, a mistake can hardly arise.

As regards the bone lesions of congenital syphilis, rickets—if we allow the nature of the changes in the skull to be an open question—is a cartilage producer, syphilis is a bone producer. Thus, syphilis produces more extensive and diffused thickening of the lower end of the diaphysis than does rickets. And further, the bone-lesions of syphilis are destructive, leading to separation of the epiphysis from the shaft, and to the formation of abscesses.

The **Prognosis** will always depend upon the extent of disease in the lungs and in the viscera. Given a case of uncomplicated bone disease, and it may be said almost invariably to get well. On the other hand, splenic enlargement, accompanied as it often is by a profound anæmia, will surely prove troublesome, and such a case may waste and die. Many such, however, do well eventually. The bronchitis, with atelectasis and a distorted chest, is also a most serious matter. It is a great risk in itself, and it also possesses a secondary risk in the liability that exists to the production of cheesy changes in the bronchial glands and a subsequent tuberculosis.

Convulsions cause death in a large number of cases, although the risk may be much mitigated by keeping the child under treatment. Laryngismus stridulus appears sometimes to cause death, although it is not always possible to be certain how far the fatal event has been caused by uncomplicated laryngeal spasm, and how far by a general convulsion.

Treatment.—In the first place, as will have been gathered from all that has gone before, rickets is a disease which may be prevented by the simple observance of such precautions as common sense would seem to dictate without instruction. The child of a sickly or exhausted mother, with poor milk, will need additional food, according to the directions given in chap. iv.; the child that is still suckled at two years of age must needs be weaned, and food of good quality supplied to it. In addition to this attention to the food, it is probably of hardly less importance to insist upon the most perfect hygiene; cleanliness, to the most minute detail, should be enforced; a tepid bath should be given night and morning; there must be no stint in the changes of the child's under-linen and napkins; cleanliness must be observed in its bedding; cleanliness in its food and feeding apparatus; and its clothing must be thoroughly warm, yet not oppressive. The air the child lives in must be attended to. The garret near the sky, dark, hot, and stuffy, is not the place for the nursery. To prevent rickets, the rooms inhabited by the child must be well ventilated, not draughty, and though warm, never hot. Plenty of out-door exercise must be given, and if the neighbourhood be unhealthy, the child should certainly, if possible, be removed to some dry and bracing place at the seaside or elsewhere.

The treatment of the disease itself must follow the same lines; but more than this, for the stomach of the child that has been fed on bread and butter, arrowroot, corn-flour, potatoes, and water bewitched by "the milk of one cow," must be educated back to the digestion of milk and such things as beef-juice and gravy.

The diet for a rachitic child must vary with its age; but seeing that most cases come under notice at eleven or twelve months old and upwards, they are generally able to digest good milk well, and they have also arrived at a time of life at which, once in a day, they may take good gravy and custard pudding, broccoli or cauliflower. Older children, of eighteen months or more, may have underdone pounded meat with well-cooked cauliflower and gravy. Eustace Smith gives a diet which cannot be improved. It is as follows: Breakfast: a breakfast-cupful of milk, with one or two teaspoonfuls of Mellin's food dissolved in it. At eleven A.M.: a breakfast-cupful of milk, alkalinised by fifteen drops of the saccharated solution of lime. Dinner at two: a good tablespoonful of well-pounded mutton-chop, with gravy and a little crumbled stale bread; or a good tablespoonful of the flower of broccoli, well stewed with gravy until quite tender, thin bread and butter, and toast-water to drink. Tea at six; as at breakfast, or a lightly boiled yolk of an egg, if no meat has been given.

But there are many rickety children who at two years of age have the development of a child of twelve months; perhaps there is bad diarrhœa, vomiting, &c. &c. In such cases the diet must be carefully adjusted to their condition. The amount of milk, will, perhaps, have to be reduced, very likely in great measure replaced by the cream and whey previously recommended on pp. 50, 51. In such cases as these, however, much reliance may be placed upon beef-juice as an additional article of diet. This is made as for the preliminary stage of beef-tea: A quarter of a pound of meat is to be finely minced and soaked in a quarter of a pint of cold water for an hour; it is then strained and well pressed through muslin, and the resulting fluid is given, either cold or warm, by the bottle or spoon. Should any repugnance to it be manifested, it may be generally disguised in an equal quantity of milk, or it may be sweetened with a teaspoonful of malt extract, or given in cocoa. It should be freshly made each day, the quarter of a pint being distributed over the day.

As regards medicinal treatment, saving the presence of special symptoms, no drugs are so successful as cod-liver-oil—which should be given in doses from twenty drops upwards to half a drachm, or a drachm three times a day (F. 17), according to the age of the child—and iron. As regards the preparation of iron, some prefer the syrup of the iodide, others Parrish's food. I like the already frequently recommended syrup of the lacto-phosphate of lime and iron, as I am under the impression that children improve more rapidly with it than with other preparations. It may be given in half-drachm or drachm doses, well diluted.

A teaspoonful of malt extract twice a day is another useful remedy, and orange-juice or lemon-juice, well sweetened, is also of advantage, and particularly perhaps in such cases as have a scorbutic tendency. Some years ago phosphorus in small doses was recommended strongly. I tried it extensively, but saw no decided benefit from it. Kassowitz and various Continental authorities have published a large series of observations upon its value of recent years, but, although some claim considerable virtue for it, the testimony is still by no means unanimous.

The **diarrhœa** of rickets should be first treated by a preliminary laxative of fluid magnesia. Subsequently, if not relieved by the dieting and abstinence from starch, Formula 10 or 11 may be given, and to either, if necessary, half a drop of opium to each dose can be added; or Formula 25 may be given instead.

The **bronchitis,** being of so much importance in these cases, must be treated carefully, even when it is of the slightest. The child should then be kept in a warm room, the atmosphere of which is made moist by a bronchitis kettle. The bowels should be opened by an aperient, and warm fomentations (or poultices, if preferred) be applied to the chest. If there be much mucus in the tubes, an ipecacuanha emetic should be given, and subsequently carbonate of ammonia (F. 1, 2, 47), or other stimulating expectorant. The treatment of such cases is more fully discussed in the chapter on Bronchitis (p. 335).

Convulsions in any form must be kept at bay with bromide of potassium and chloral (as suggested at p. 612), while the general health is undergoing restoration. The ventilation of the nurseries requires special attention under these circumstances. More fresh air should probably be advised, and the body should be sponged with cold or tepid water night and morning. These are cases no doubt in which it is necessary to steer between Scylla and Charybdis, for while it is important to reduce the undue nervous irritability by such measures as these, it is equally necessary to avoid the occurrence of those bronchial attacks which are so fatal.

The deformities of the limbs in rickets are to be prevented by keeping the rachitic child entirely off its legs until its bones become stronger. To ensure this, splints which render walking impossible must sometimes be applied; but the less of splinting the better. One of the essentials of rickets is muscular failure, and it is above all things necessary, while the bones are hardening, to keep the muscles in as healthy a state as possible. For this end it is hardly possible to take too much pains; and shampooing or friction should be carried out regularly and thoroughly—the mother's or nurse's hand, well oiled, should gently rub and manipulate all the muscles of the trunk and extremities for half an hour regularly night and morning; and such stimulating treatment as salt baths and rubbing with a soft towel should be used in addition.

As regards the remedy for the more severe distortions of rickets, it is important to remember how common these are in childhood, how rare in adult life; the inference being, as is well known to be the fact, that, except in extreme cases, Nature herself repairs the deformities as the bones grow and strengthen. But surgical aid is often necessary, by the application in various forms of elastic extension, by splints, and, as a last resort, by the rectification of otherwise irremediable curvatures of the limbs by osteotomy, &c.

It is yet necessary to mention **late rickets** and **fœtal rickets.** But when, at the outset, the question arises, Do such diseases exist? it will be apparent that not much is known about them.

Late Rickets is a rare but well-recognised condition, in which the bones of children eight or ten years old soften and undergo extreme distortion. This form of disease, therefore, does not occur until the rickety period has gone by. Yet it is called "rickets." Sir W. Jenner says: "I have seen rickets begin in children seven and eight years old." There is much difficulty in coming to a definite conclusion on such a point, for, on the one hand, there is no improbability in the occurrence of a true rachitic condition at this time of life, seeing that the skeleton is still in an active state of development and growth; on the other, it is equally admissible to hold that some such condition of reabsorption of mineral matters and degeneration takes place as appears to happen in mollities.

The term **Recrudescent Rickets** seems to describe best several of the cases which have been recorded as late rickets; for there is evidence that at the usual age, that is about the second year, the child has suffered with well-marked rickets, then for several years the disease has been quiescent, and at or just before the age of puberty the child has begun to experience vague pains in the limbs, has become progressively weaker, and at the same time bending of the bones has occurred.

Symptoms.—These children are born healthy, and, in some cases at least, they have come of perfectly healthy stock. The recorded cases show that up to a certain period they have been strong, except as already mentioned that some of them have shown evidence of rickets in their early childhood, and then, perhaps after some serious illness such as measles or scarlatina, in an insidious way, generally with more or less pain, the extremities have become bent. In more than one instance fracture has occurred in one or more of the bones. Then the thorax has flattened in, and thus the case has remained sometimes for many years, with stunted growth, and sometimes also with childish intellect. In a few instances death has occurred, perhaps from bronchitis or some other thoracic affection.

Morbid Anatomy.—Very few data exist on this head. Such as there are show (1) that in the majority of these cases the bones are exceedingly thin and brittle. This is seen (α) from the frequency with which fractures have occurred, sometimes in numerous bones, from very insufficient causes; and (β) from observations such as that of Mr. Barwell, who records that he operated upon one of these cases to remedy a deformity, and the chisel went through the bone with the greatest ease; while, on passing his finger into the wound, the bone was a mere thin shell, full of an excess of oil.

(2) Another case is on record,* in a boy of eleven, who was subjected to examination by Dr. Hilton Fagge, Mr. Warrington Haward, and Dr. Drewett. These gentlemen considered the changes to be identical with those of rickets. The wrist ends in this case were enlarged, the bones were much distorted, and the child was quite helpless. He subsequently died, and a post-mortem examination was made by Dr. Abercrombie and Sir Thomas Barlow, from whom I learn that the epiphysial line of the bones was found thickened and irregular, as in common rickets.

(3) There is yet another case worth mention, in a girl of ten, under the care of my colleague, Mr. Davies-Colley.† She had always been pale, thin, and delicate, and from an early age the ankles grew outwards and the knees inwards. The humerus fractured, and subsequently the femur, and for this, at the age of ten, she first came to Guy's Hospital. It was then found that the long bones were very tender and flexible, and their outer shell could be pressed inwards like the skull in craniotabes. The urine was much deficient in phosphoric acid, only one-third the normal amount being present; the calcium was in excess. She died, at the age of thirteen, from a suppurative pyelitis, due to the formation of phosphatic calculi. After death several of the bones were found much distorted—some were hypertrophied and dense, others light and thin, and in some were tumour-like expansions of a light porous bone, with fibrous-looking tissue intersecting them. The microscopical examination by Mr. Symonds showed a complete absence of compact tissue and of Haversian systems, a porous bone being filled by fibrous tissue. Mr. Symonds remarks that this development of fibrous tissue with great wasting of the bone agrees with the description of late rickets given by Cornil and Ranvier rather than with osteomalacia. But if it agrees in this respect with late rickets, it can hardly be said so to do with common rickets; and I have stated the case of late rickets in a threefold manner in order to show that, whether or not all these cases are related to each other, there are at any rate several varieties of the disease included under this term—some "identical with rickets"; some (and I

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* "A Case of Late Rickets," by Dr. Dawtrey Drewett; *Trans. Path. Soc. Lond.*, vol. xxxii. p. 386.

† *Trans. Path. Soc. Lond.*, vol. xxxv.

think the majority) evidenced by atrophy and fragility of bone, very like osteo-malacia ; some not quite like either, possessing in addition peculiar features, which make them difficult to classify.

Besides cases such as have now been mentioned, Rehn, of Frankfort, has described a condition, which he calls **Infantile Osteo-Malacia,** which differs in some points from ordinary rickets. The bones of the skeleton become thin, soft, and porous, and their medullary canals disappear before an advancing growth of soft porous bone. The bones so affected are quite readily cut with a knife ; but in the only two that have been examined after death, there were distinct rachitic changes in the cartilage zone, though but moderate in degree. This state of things occurs in young children. I have met with an instance which, in respect of softness, resembled this one, but which was otherwise characterised by a remarkable growth of bone, in a girl of fifteen months old. In the skull, the new growth and consequent thickening were enormous ; a pile-like new bone gradually monopolised the diploic space ; in the extremities, fusiform nodes were produced, in which more or less of the entire thickness of the shaft was converted into the same soft material. These changes were associated with pronounced rachitic changes in the ends of the bones, and some have considered the entire process a rachitic one ; but the marked degree of generalised bone-softening, and the enormous development of imperfect bone, are conditions which form no part of common rickets in the human subject. Bone-changes, in many respects resembling these, have been found in unquestionably syphilitic infants. "But," borrowing the words of the committee that examined the specimens,* "that such are necessarily and solely syphilitic appears to us in our present state of knowledge not proven. The apportionment of the effects produced severally by rickets and syphilis in this and other cases cannot as yet be determined." Very much the same must be said of late rickets and its relation to osteo-malacia. Some cases more resemble rickets, others osteo-malacia ; but whether the real meaning of this be that the two diseases are the same, with now one part of the process now another in the ascendant ; or whether we have several distinct diseases which in anatomical change resemble each other, is uncertain in our present state of knowledge. Let the obscurity that surrounds the subject stimulate the reader to investigate these very interesting diseases. I ought to add that Dr. Judson Bury, of Manchester, has recorded a case of a female infant of eight months,* which, in the absence of any rachitic changes, in the appearances in the medulla, in the thinning, and easy fracture of the bones, is not unlikely to have been an example of true osteo-malacia. Sir Thomas Barlow was kind enough to show me specimens of the bones from this case, and the appearances certainly closely resembled those of the osteo-malacia of adults, whilst those of rickets were absent.

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* Dr. Hilton Fagge, Sir T. Barlow, Mr. Warrington Haward, and myself : *Trans. Path. Soc. Lond.*, vol. xxxiv. p. 201.

Prognosis.—This must be somewhat guarded. Fractures in these cases repair readily, so that there is no want of activity of a sort, although it is hardly of the kind that is required. Some of these cases have lived sufficiently long to pass out of notice, a few have died from bronchitic and other complications.

Treatment.—They must be treated on the same lines as the rachitic patient, and it will be unnecessary to say more. Inasmuch as the bones fracture spontaneously with the least force, the greatest care must be taken to avoid all undue movement and exertion.

Fœtal Rickets.—The occurrence of true rickets at birth, or **congenital rickets,** is very rare. Most authorities doubt whether it ever occurs, although, as I have said, one need not be surprised at the occasional happening of such a thing. Steiner mentions the existence of a specimen of rickety fœtus in the museum of the Hospital for Sick Children in Prague, and other cases are on record; but few are free from doubt, owing to the fact that achondroplasia, an entirely distinct condition, has until recently been confused with fœtal rickets.

It seems possible also that other conditions besides rickets, may produce defective bone-formation *in utero;* mere fragility of bones is not proof of rickets.

Cases, however, have been recorded in which several of the symptoms of ordinary post-natal rickets were present at birth. Townsend describes a case in which beading of the ribs, enlargement of epiphyses in the limbs, curvature of bones, and some fractures were present in a premature infant at birth, Dr. Ashby has recently recorded a somewhat similar case. A noticeable feature in this congenital rickets is the frequency of fractures of which often half a dozen or more are present; some of these may be caused during parturition; but not all, for the fracture has been found already partially united with callus at birth.

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* "A Case of Osteo-Malacia in a Child," *Brit. Med. Journ.*, 1884, vol. i. p. 213.

The outlook in congenital rickets is more satisfactory than might have been expected: if the infant is properly fed with breast-milk or with carefully modified cow's milk, and due care in fixation of the fractured bones is taken, rapid union of the fractures occurs, the rachitic process ceases, and after a few months, little or no trace of the disease may remain.

Achondroplasia is characterised chiefly by the curious shortness of the limbs. The trunk is of normal length, and thus appears altogether out of proportion to the stunted limbs. The hands are broad and short, the head is relatively large, the lips are thick, and the bridge of the nose somewhat depressed. The buttocks are very prominent as the child stands.

In the cases we have seen, intelligence has been about the average, and except for the stunted growth the children seemed healthy.

Examination of the bones has shown, as Barlow has pointed out,* that there is no rachitic change. Ossification at the epiphysial line is perfectly regular: the striking feature is the relatively large size of the upper and lower epiphyses of the long bones as compared with the stunted shafts.

Achondroplasia is perhaps most likely to be mistaken for cretinism, but apart from the fact that a true cretin does not show any such marked changes at birth, the mental condition of the achondroplasic dwarf is good, his hair is normal, and his figure is altogether different from that of the cretin, who is characterised not by prominence of the buttocks but by his protuberant abdomen. Dr. John Thomson has also drawn attention to the separation of the middle and ring fingers in achondroplasia, another point of distinction from cretinism. It is said that most cases of achondroplasia are either still-born or live only a very short time, but now that the disease is becoming more recognised it seems probable that it will be found less rare than was supposed.

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* *Trans. Path. Soc.*, vol. xxxii. p. 364

CHAPTER LIV.

CONGENITAL SYPHILIS.

Hereditary Syphilis plays a large part in the diseases of infancy, and is of great frequency amongst hospital out-patients. I shall describe the disease much as I have seen it, and from notes of 158 cases now before me. The ages of these children when brought for treatment were as follows:

3 weeks	1	8 weeks	10	4 months	14	9 months	6
4 ,,	2	9 ,,	7	5 ,,	6	10 ,,	4
5 ,,	6	10 ,,	8	6 ,,	10	11 ,,	3
6 ,,	6	12 ,,	21	7 ,,	6	12 ,,	2
7 ,,	5			8 ,,	7		

Ten others were between one and two years, and twenty-four cases occurred in older children.

As is well known, syphilis is a common cause of miscarriages and premature births, and it occasionally shows itself in the child *at birth*. But it is much more common in infants of a few weeks old, and from the fifth or sixth week up to the fourth month appears to be its favourite time. In most of such cases the tale is that "it was a beautiful baby born," and perhaps at a month, six weeks, or two months, a rash begins to appear.

The **symptoms** are those of secondary syphilis in the adult —of the eruptive stage of an exanthem—but they are somewhat less regular than in adults. As Mr. Hutchinson puts it, "the tertiary and secondary stages are sometimes strangely mixed"— to wit, the frequent occurrence of bone trouble in children at the same time as the cutaneous eruption. It is probable that the symptoms are more regular and more severe the more recently either or both parents have suffered from the acquired disease.

When syphilis occurs at birth the child is likely to be a shrivelled up mite with a feeble cry, and a skin of a coppery colour with scaling cuticle. The mouth and lips may be fissured and thick, the edge of the anus or buttocks ulcerated, and the soles of the feet red or coppery and scaling. In the worst cases the entire body may be covered with moist and brownish scales or crusts, and here and there blebs containing serum or sero-purulent material—a state of things which has been called syphilitic pemphigus, though "bullous syphilide" would be more appropriate. Most of these very early and severe cases die. They take food badly and become exhausted.

If we take a case in somewhat older infants, if the disease be severe, except that the child will in all probability be in plumper and better condition, its surface will be much in the same state. There will probably be a raised coppery eruption, with delicate scales or scurf covering its surface, and with serpiginous margin, spreading over the head, face, and trunk. The eyebrows may have come out, the nose and lips will be thick and fissured, perhaps small mucous tubercles will be visible at the angles of the mouth or the corners of the eyes, the nasal mucous membrane thick and the child "snuffling"—some think from mucous patches here also; there will very likely be bullæ or small ulcers about the penis and scrotum, condylomata about the anus, and scales of some thickness about the soles of the feet, and possibly the palms of the hands. In these severe cases I think the liver and spleen are less likely to be affected.

In milder cases there is snuffling, more or less of a squamo-tubercular rash or a coppery roseola of irregular blotches, with fewer scales; perhaps a fissured anus, with condylomata. The syphilitic infant will sometimes present a dirty tint of face, called the *café-au-lait* tint; but this is more common in the severer than in the milder cases, in which the child, although the symptoms are so pronounced as to leave no doubt about the malady, may be plump and good-looking.

Perhaps I should also add that the composite of symptoms is very varied. Let us take a few. In one case—a child of eight months—there was a well-marked *café-au-lait* tint, craniotabes, small circular ulcers in numbers round the anus, and a history of snuffles. In another, snuffles and craniotabes only. In another, a well-marked coppery scaly syphilide round the mouth. In another, snuffles, thick lips, depressed alæ nasi, and red indurated gummatous lumps in the skin of various parts of the body. In another, no evidence of the disease save condylomata and perhaps snuffles (this is a very common case). In another a bullous eruption, followed by condylomata. In another, a diffused redness of the soles of the feet and the palms of the hands, with a faint maculation of the buttocks and legs.

As regards the rash upon the skin in congenital syphilis, a gyrate scaly eruption, with slight thickening (the squamo-tubercular syphilide or syphilitic psoriasis), seems to me to be more common than a macular syphilide, or syphilitic roseola, as it has been called. A diffused redness and scaling of the soles of the feet is also very common; so, too, are snuffling, fissuring of the lips, and mucous patches at the angles of the mouth, fissures of the anus, condylomata, superficial ulcerations over the buttocks and scrotum, intertrigo, &c. As rarer conditions, furuncular eruptions may be mentioned—red indurated masses in the connective tissue—which suppurate, if at all, very slowly and by a small aperture in the skin. Sometimes the skin presents circular coppery patches, in the centre of which the cuticle is slightly raised and translucent, looking as if about to form a bleb. In others there may be an annular eruption, with the skin in the centre healthy, and not altogether unlike patches of tinea. Bullous eruptions are not very uncommon, but the bullæ are often only represented by circular or oval superficial abrasions or crusts.

Once I have seen a condition intermediate between these two cases last mentioned—a child of four months, in whom, distributed over the body, but chiefly on face and scalp, were slightly raised circular flat brownish spots, which vesicated superficially, and then dried in the centre into a brown crust. The condition spread by circular ripples, and left superficial ulcers, which rapidly healed under mercurial treatment.

In bad cases the skin generally will assume a brown, thickened, wash-leathery consistence, from diffused chronic dermatitis.

Syphilis sometimes causes extreme anæmia, so that the child has a waxy complexion often with a tinge of brownish-yellow on the cheeks, and as in rickets the most striking change in the blood may be deficiency of hæmoglobin. There are no characteristic changes in the proportions of the various kinds of white corpuscles: the blood usually shows only the characters of a secondary anæmia such as is produced by several diseases. The relation of syphilis to the so-called "splenic anæmia" of infants has not yet been determined (*vide* p. 453) but of the association in some cases there can be no doubt.

Laryngitis is very common, as may be judged from the frequency with which hoarseness is met with. Henoch attributes this, and no doubt with some probability, to the formation of mucous tubercles about the larynx; but, so far as is actually known, a more general thickening of the mucous membrane of the epiglottis takes place, such as is so common in adult life. Sometimes extensive ulceration occurs; an instance of this, in an infant of four months, I have already recorded in chap. xxii. (p. 326), when dealing with diseases of the larynx. Somewhat severe laryngeal symptoms occurred eleven times in the series of cases given, but in one case I am not sure that they may not have been due to iodism. The child was three months old, and was only taking fifteen drops of the syrup of the iodide of iron three times a day. This it had done for ten days, a grain of hyd. c. cret. being given twice daily in addition. Suddenly, when the macular syphilide was disappearing, a most profuse muco-purulent discharge began to come from the nose, with much hoarseness also, and subsequently angry boils appeared in various parts of the body.

Hepatic and Splenic Enlargement occur not infrequently, the latter far more commonly than the former. Dr. Gee says the spleen is palpable in about one-half the whole number of cases; I should not have put the proportion so high. It would appear that hepatic enlargement but seldom occurs by itself, for, of seventeen cases, eleven were simple enlargements of the spleen—in the remainder both liver and spleen were large. I have no note of any case of hepatic enlargement alone.

Bone Disease.—For much that is interesting regarding the pathology of this form of syphilitic affection, I must refer the reader to what has been said under the head of Rickets. I shall only repeat now, that of late it has been contended, particularly by M. Parrot, that there is a syphilitic form of disease of the cranial bones, as well as one which attacks the epiphysial ends of the long bones. The disease of the cranium is characterised by a velvet-pile-like growth of bone upon the outer surface of the skull, which spreads over the bones around the anterior fontanelle, between the sutures and the centres of ossification. Thus the sutures come to form furrows, and the calvaria is bossed. In company with the new bone formation goes a process of softening and atrophy, and thus the occipital bone is usually, and the other parts are occasionally, thin, soft, and compressible (craniotabes). That this form of skull is found in syphilitic infants there is no doubt whatever; that it is found in syphilitic infants who are quite moderately rachitic there is also no doubt; but whether it is ever present in infants who are free from all traces of rickets is open to question; and how much of the diseased process is due to one disease, how much to the other, or how much to some *combination* of favouring influences, is very uncertain. This much, however, may again be insisted upon, that syphilis is an energetic producer of new, though oftentimes of bad, bone. Rickets is pre-eminently a cartilage-former. The exuberance of bony deposit is therefore in favour of syphilis rather than of rickets, which even in its reparative stages, is not generally known by a propensity of this kind. The disease, as it is seen in the ribs, is difficult to distinguish from the changes of rickets, unless, as is sometimes the case, it occurs in parts of the bones other than those bordering upon the costo-chondral articulation. As to the lesions in the other bones there is less doubt. They are certainly, in the main, quite distinct from rickets. The bone at the junction of the epiphysis with the shaft undergoes a slow caseous inflammation; more or less periosteal bone is developed from the epiphysis upwards along the shaft, giving rise to considerable thickening; subsequently an abscess forms, and the epiphysis becomes separated from the shaft. At the same time, the medullary parts of the diaphysis undergo atrophic changes by the overgrowth of a gelatinous medulla, and there are also minor changes of irregular ossification and calcification, such as might be expected from an interference of this kind with the natural processes of ossification. Here, again, as compared with the usual run of rachitic bones, syphilis is known by the amount of bone which is found in the periosteum; and in such cases as I have seen there has been no evidence whatever of a growth of cartilage such as characterises rickets. It has not been my experience that many bones are liable to be affected at once: three times only out of seventeen was it so. In the series of 158 cases, seventeen were examples of bone diseases, not including cases of craniotabes. They were mostly cases of what might be called "nodes," but once or twice abscesses formed; in one case both elbows suppurated. The disease was situated at the elbow eight times; at the shoulder twice; at the wrist thrice; the finger once; the knee twice; the middle of the shaft of the tibia once; the ribs twice; the cranial bones twice. (The multiple lesions are counted separately.) The spleen was enlarged in three of the cases; the liver and spleen together once. In most there were other well-marked evidences of congenital syphilis.

The following may be given as an illustrative case:

A female child of six months was brought to the hospital for swollen joints of six weeks duration. One child had been born dead, and when three months old this child had been covered with an eruption of some kind. The child was very small, with snuffles and a depressed nasal bridge; the lower lip was deeply fissured, and the body was covered with small coppery blotches; the buttocks were ulcerated; the anus was swollen and fissured.

The two elbow-joints, the left wrist and shoulder, both knees, and the left ankle, were considerably swollen, the joints being more distorted than is usual in rickets. The ulna and radius had a nodular thickening just *below* the articular surfaces of the elbow, the humerus a thickening *above*. A similar condition obtained in the other bones—viz., a nodular thickening just above the joint, and not quite continuous with the articular end of the bone; the left knee and wrist were painful; there was slight nodular swelling of the rib cartilages at the junction with the bones; the spleen was hard and extended down to the umbilicus; the liver extended half way to the umbilicus.

The disease is one that occurs in very young children—from five weeks old. Three cases occurred in infants of two months and under; five at three months and under; three at four months and under; the remainder being six and eight months or more. It causes a good deal of pain, and perhaps advice will be sought for the child, because, as in some cases of rickets, it cries whenever it is moved, or a limb appears to be paralysed. When the disease has advanced sufficiently far to produce separation of the epiphysis, there may possibly be a faint crepitus obtainable.

The immobility of the affected limbs has been called by

M. Parrot **syphilitic pseudo-paralysis,** to distinguish it from infantile paralysis of neural origin; but it must be added that Henoch describes cases of paralysis—chiefly of the arms—in syphilitic infants, in which there were no evidences of bone disease.

These cases must, however, be difficult to distinguish with certainty, because in addition to the bone affection, the tendency to muscular inflammation—well known in adults—cannot be altogether excluded.

There is, however, no reason to doubt that, as in adults, the nervous system suffers also in congenital syphilis. Peripheral neuritis, for example, would seem to be a very likely occurrence, and Sir Thomas Barlow has recorded two cases *—one a female infant of a month old, with meningitis, arteritis of the cerebral vessels, and choroiditis; the other a male child of fifteen months, with gummata on the cranial nerves and disease of the cerebral vessels.

Ulceration of the Tongue, of all degrees, is very common in congenital syphilis, though I have more often seen a dorsal ulcer of some size and depth than a more superficial and generalised condition.

Mr. Hutchinson, however, speaks of a diffuse stomatitis without ulcers, of like nature to, and one may suppose part of, the general swelling which attacks the nasal mucous membrane.

Of other rarer conditions iritis and choroiditis may be mentioned as occasional occurrences. Mr. Hutchinson has recorded twenty-three cases of iritis, the majority in girls about the age of five weeks. It is liable to be overlooked, as the cornea is generally clear.†

Orchitis is an occasional symptom, and has usually occurred in our experience within the first year of life; but Henoch refers to cases in which the testicle became swollen and hard when the child was two or three years old: and in one of his patients there was found to be much increase of the interstitial connective tissue in the testicle post-mortem but no gumma. We found orchitis in 5 out of 64 male cases, in three of these it was observed at the age of twelve weeks.

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* *Trans. Path. Soc. Lond.*, vol. xxviii. p. 287, *et seq.*

† Fagge, "Pract. of Med.," vol. i. p. 134.

The **Morbid Anatomy** of congenital syphilis is seldom much. But, although definite lesions form the exception, syphilis is a fertile source of infantile atrophy, and sometimes of multiple visceral lesions. For example, there may be pleurisy; the lung may be in that condition of consolidation which has been called "white hepatisation" (p. 364); the bones may show the changes already described; the liver may contain gummata, or be, as is more usually the case, hard or elastic and large, not much altered to the naked eye, but much so microscopically—the lobular arrangement being broken up by a diffused fibro-cellular growth, like that which has been thought to be derived from Glisson's capsule, or from the activity of growth of the hepatic cells themselves. The spleen, in like manner, may be large, dark-coloured, hard, and traversed by tough fibrous bands; whilst, as rarer conditions, Dr. Coupland has found in a female child of three months, not only gummata in the liver and lung, but also interstitial myocarditis and nephritis.*

Acute nephritis has several times been observed amongst the earliest manifestations clinically, and at autopsy has, in most cases, shown a mixture of interstitial and parenchymatous inflammation. Dr. Carpenter † has recently described two such cases, one at the age of five months the other at the age of five weeks.

Congenital syphilis, once cured, is not liable to relapse—at any rate, so far as the eruption is concerned; though an occasional condyloma may show itself about the anus or angles of the mouth; perhaps a sore throat or a laryngitis. But the chief peculiarity about the disease is that sometimes, not very often, it shows itself by symptoms quite distinct from those which occur in infancy.

Late Hereditary Syphilis: Syphilis tarda.—Under this head some have distinguished the symptoms of congenital syphilis which appear after the period of infancy; but it must not be imagined that they are always separated by any definite interval from the infantile manifestations. It is true that usually these later symptoms do not appear until the child is at least six years old, but sometimes they seem to be almost continuous with the infantile syphilis, the child is continually ailing, and perhaps iritis or some scaly syphilide or some other definite lesion bridges over the period between infancy and the beginning of the second dentition; so that one must not draw too sharp a line between the early and the late manifestations of syphilis in childhood. Some of these later symptoms are, however, quite distinct from those seen in infancy, and so require a separate description.

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* *Path. Soc. Trans.*, vol. xxvi. p. 303.

† Rep. Soc. Study of Dis. in Childr., vol. iii. p. 286.

The more characteristic symptoms are interstitial keratitis and teeth of a peculiar shape and arrangement: and these are associated often with a stunted development, distorted bones (either bent or nodose), a sallow lack-lustre skin, a sunken nose, and a fissured mouth. There may even be deafness, aural discharge, ozæna, chronic ulceration of the palate with perforation into the nose, and unhealthy abscesses in various parts of the body, which may give rise to nasty discharges. After drawing such an ugly picture of the extreme case of congenital syphilis, it is only fair to remind the student that he must not expect to see such things in every case, perhaps one might even say in the majority of cases. It is no uncommon thing for a pretty child with well-formed features and nothing whatever in its appearance suggesting a congenital taint, to develop a gumma, or some other indisputable evidence of syphilis; and when one adds that in these cases of late hereditary syphilis it often happens that no history whatever of infantile manifestations can be obtained, it is evident that the diagnosis may not always be easy. Some of these cases are very puzzling; the thickened bones, with much irregularity of the surface, and perhaps curvature and caries, the unhealthy abscesses, and ozæna, compel us, in the absence of proof, to halt between syphilis and struma.

Mr. Hutchinson calls these *tertiary* symptoms. Indeed, as in the adult, so also in the infant, the eruptive or secondary stage passes off, and health is regained, perhaps for good. Yet, it may be that after a variable interval, further symptoms develop, such as those detailed. The lesions are usually symmetrical. The appearances of interstitial keratitis vary according as it is recent and acute or of old date.

Mr. Hutchinson's description of the disease is practically as follows: It is more common in girls than boys. In the acute stage both corneæ are usually affected, and they become of a bluish opacity, due to the effusion of lymph into their substance. There is a zone of ciliary congestion, but no ulceration. There is considerable intolerance of light. The inflammation clears considerably, but leaves opacities of a nebulous appearance, which are easy to overlook. The permanent teeth are peculiar, in being set with much irregularity, in being dwarfed, deformed, and tending to decay. The upper central incisors have a vertical central notch of a more or less crescentic shape; the canines are deformed, the crown of the tooth being peggy or pointed; the molars may be dome-shaped; all the teeth are small, and thus gaps are left between them.

These various symptoms may be found at all ages, from seven or eight years up to eighteen or twenty, or even further. Mr. Hutchinson has repeatedly seen patients of various ages, from twenty to eight-and-twenty, become the subjects of syphilitic keratitis for the first time.

But there are other changes which must be mentioned. It is by no means uncommon to find gummata in children during the later period of childhood. They occur especially in connection with the long bones, particularly the forearm and the leg. A diffuse massive thickening of bones is also very characteristic, the tibia especially is affected in this way by a chronic ostitis and periostitis, which results in considerable deformity; and sometimes leads to some necrosis of bone.

Joint affections are rare. In a boy aged six years who came under notice with well-marked congenital syphilis there was considerable thickening of joints with some effusion, which under antisyphilitic treatment entirely recovered. We have also seen a condition very like the osteoarthritis of adults more than once in boys with congenital syphilis.

The liver is occasionally found to be enlarged with big bosses on the surface, which subside rapidly under specific treatment: there seems no reason to doubt that in these cases gummata are present. It is, however, by no means common at autopsies to find gummata in the liver in children beyond the age of infancy; probably because they are so readily cured. Cirrhosis of the liver has already been mentioned as occasionally one of the later results of congenital syphilis (*vide* p. 754); gummata elsewhere are rare; very few cases have been recorded of their occurrence in the spleen in spite of the frequency with which it is enlarged. We were only able to collect six cases.*

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* *Path. Soc. Trans.*, vol. xlviii.

In the kidney gumma scarcely occurs, but congenital syphilis has been associated rarely with a diffuse interstitial nephritis.

The lymphatic glands occasionally show considerable enlargement in the later cases of congenital syphilis without any apparent local cause.

The nervous system suffers but rarely in these older children. Cases have been recorded which resemble the general paralysis of adults in children below the age of puberty, and autopsies have revealed pachymeningitis with changes in the cortex. We have met with similar pathological conditions in children who were almost certainly the subjects of congenital syphilis. Some such organic lesion, no doubt, underlies a certain number of the cases of idiocy in the syphilitic, and we have elsewhere (p. 636) referred to the progressive dementia which sometimes develops in these older children with congenital syphilis.

In late hereditary syphilis, as in adult syphilis, lardaceous disease sometimes occurs, but is rare. We have seen at least two such cases.

Contagion.—There is good evidence that congenital syphilis is contagious just as is secondary syphilis in the adult; but it is not less true that instances of infection from a child with congenital syphilis are exceedingly rare. Fortunately the person who must be exposed most to contagion, the mother, is in accordance with Colles' law, immune (*vide* p. 759). But it must be remembered that this immunity does not extend to a healthy wet nurse, who should never be allowed to suckle a syphilitic infant.

Diagnosis.—The chief difficulty lies in the frequent failure of many of the characteristic symptoms. A large number of children have no symptom but snuffling, which is suspicious but not pathognomonic; others perhaps have craniotabes; others, laryngitis and an enlarged spleen, or an enlarged spleen and a dirty anæmic tint of the face; and so on. Thus it often happens that a doubt remains; and this is so, even if the most careful inquiries be made as to the parental illnesses—sore throats, rheumatism, eruptions, miscarriages, &c. At all stages of its history syphilis trails the scent of scrofula, and the evidence one way and the other must be balanced as well as may be.

Prognosis.—Many children waste and die during the progress of the eruptive stage; but, if seen early and subjected to treatment, a great many recover, and may lose all traces of the disease, save for such a scarring of the face or trunk as may be left behind by the eruption. I have known epilepsy to occur in older children, who had suffered in this way. The severer generalised bullous forms of eruption are highly dangerous, and, if a child wastes persistently under treatment, the position is one of gravity; the same is true if there be much diarrhœa, snuffles, or bronchitis; but failing all these things, the child will probably do well.

Treatment.—"The only certain cure for infantile syphilis is mercury," writes Henoch; and probably in that short summary lies the kernel of the experience of all. The mercurial may be administered either by giving it to the mother (a plan which has been advocated strongly by some, but which I prefer least of all, as too uncertain), by internal administration as grey powder to the infant, or by inunction.

I have nothing to add to the statement of Dr. Eustace Smith, that in the hydrargyrum c. creta, or the liquor hydrargyri perchloridi, we have two effective and easily borne preparations. The former may be given in grain doses night and morning, with two or three grains of carbonate of soda or bismuth, and this dose may, if necessary, be increased to two grains of the mercurial. In case of diarrhœa, the solution of the perchloride of the British Pharmacopœia may be given; infants take it well in doses of one to three minims, which may be gradually increased if necessary.

The inunction is carried out by rubbing half a drachm of the mercurial ointment upon the abdomen, back, or sides, and covering the part with a flannel bandage afterwards. The child should be well bathed every morning with soap and warm water, before the daily inunction is made.

Besides specific treatment of this kind, attention must be given to all those more general means which will ensure the preservation of the child's health. The food must be attended to, and suckling should of course be carried out by the mother if possible. But here may come a difficulty. Supposing that she should show no signs of disease, is the child to be weaned for fear of contaminating her? This is a question that cannot be answered by a Yes or No. It is held by some that the ovum can be infected through the father, and the child be born syphilitic, the mother all the while remaining intact. If that be the case, the answer must be Yes. But, on the other hand, there is a strong *à priori* improbability of any such freedom being possible; and there is also the fact, vouched for by many observers, that the infant thus syphilised *in utero* never contaminates the mother by suckling, although she may show no signs of having already been syphilised (Colles' law). If this be so, the answer will be No; for the fact is inexplicable, except on the hypothesis that the mother is already proof in some way against infection, and this is certainly much the more probable belief. It is almost inconceivable that a fœtus should lie *in utero* for many months, receiving from, and returning to the mother, a constant blood supply without conveying the disease from which it is suffering, and which is known to be so easily inoculable. On the other hand, it is in consonance with all we know of infectiveness, that the mode of introduction of the poison may lead to such modifications of the disease as may render it more or less incapable of recognition. On the whole, therefore, it is probable that a mother that bears a syphilitic infant is proof against contagion, and may suckle her child if it be considered advisable, as, in most cases, it certainly will be. As a first thought, therefore, for the safety of the child, the mother's health must be attended to. Not at all improbably, a little of the liquor hydrarg. perchlor. or some iodide of potassium may better her condition, and, while acting upon her, act upon the child through the medium of the milk; but all other means for improving her health, in the way of good food, fresh air, &c., must be adopted as well.

If the mother is unable to suckle her child, then artificial human milk or goats' milk or asses' milk are the best substitutes; but chap. iv. and those which follow it will supply all information on this head.

Wasting, diarrhœa, and vomiting, require the same kind of treatment that they receive under other circumstances, such as have been detailed in chaps. v., vi., and ix.

Of the local conditions, the enlargement of the liver will often rapidly subside under mercurial treatment. That of the spleen is much more troublesome, and its continuance is no warrant for the prolonged administration of mercury if all other signs of the disease are in abeyance. In the pneumonia and the bone disease of the syphilitic infant the specific must be continued, in the one case with stimulants such as carbonate of ammonia (F. 2) or alcohol, in the other with iron and cod-liver oil. The penumonia is fortunately rare; but neither complication responds quickly to remedies, and a case of either kind, except where the bone disease is confined to the production of a natiform skull—which does not much influence the prognosis—must be treated as of doubtful issue.

A large number of the troubles of infantile syphilis are shown upon the skin. Condylomata are perhaps the most common. The parts are to be kept scrupulously clean by frequent bathing and change of linen, remembering that syphilis is always ready to pounce upon seats of local inflammation. Cracks, fissures, excoriations of any kind, are likely to lead on to ulceration or condylomata. Condylomata are to be kept as dry as possible, and dusted with calomel night and morning. The calomel may be used pure, or mixed with an equal part of oxide of zinc, oleate of zinc, or the sanitary rose powder.*

The same treatment may be adopted for the small patches which occur at the angles of the mouth.

In the dry eruptions nothing is generally needed but the internal treatment. For such patches as are intractable, the mercurial ointment may be applied, or a dilute solution of the oleate of mercury—the 5 per cent. strength diluted with three parts of carbolic oil, strength 1 to 40. For the ecthymatous sores that form over the trunk and extremities, and about the nates, the ung. hydrarg. oxid. rub. is as good as anything, and for some of these cases a mercurial bath may be given twice a week. Dr. Eustace Smith recommends that half a drachm of the perchloride of mercury should be dissolved in each bath. After the more definite symptoms have subsided, the child will usually require a prolonged administration of iodide of iron and cod-liver oil, not only with the object of keeping up its strength, but to ensure if possible a freedom from chronic disease of bone, ozæna, and such things as go under the general term of "struma," and which blight the happiness not only of the child but of many a family also.

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* A preparation of boric acid, suggested by the late Mr. Edward Lund of Manchester, and prepared by James Woolley and Son of that city. It may be obtained of any chemist.

CHAPTER LV.

DISEASES OF THE SKIN.

THE skin diseases of children are so numerous, and the literature of dermatology is so extensive, that the subject does not readily lend itself to a manual which treats of general medicine. I shall, however, refer shortly to those more common affections which are of everyday occurrence, and to some few of the rarer conditions such as I have met with personally. A fuller treatment of the subject will not be necessary, considering the many excellent manuals that have been written of recent years.

As a preliminary, let me say that perhaps there is no organ of greater importance than the skin in childhood. It is in many cases a most sensitive index of inefficient working elsewhere: its suggestions as to constitutional peculiarities are often of the utmost value to the physician; when not properly cared for it readily goes wrong; and rough handling is quickly resented. Its very activity is a source of danger if it be neglected, and many of the diseases of the skin in infant life are directly chargeable to neglect. Therefore, as a general principle, it is of the first importance to attend to scrupulous cleanliness. A good bath once a day is not too much for any child, and a bath night and morning should be given to young children. Most children perspire readily and excessively, particularly during sleep, and retained perspiration about the neck or in the groin, &c., produces first miliaria and then intertrigo. Plenty of bathing and the use of sanitary rose powder, on such parts as are liable to retain the secretions, will no doubt avert many a case of what would otherwise prove a troublesome eczema intertrigo.

Warmth is another essential. Custom has prescribed that young children shall wear low dresses, short sleeves, petticoats, and no covering at all for the lower part of the abdomen and thighs, save a pair of linen drawers. This is a custom framed upon a weakest-go-to-the-wall principle, which is opposed to the very *raison d'être* of medicine. Children's clothing is to be light and loose and warm. The method of accomplishment of these aims hardly needs a more detailed statement.

The more common affections of the skin are: Lichen—often called "strophulus" or "lichen urticatus," from its almost inseparable connection with urticaria—eczema, impetigo, ecthyma, furuncular eruptions, herpes of all patterns, erythema likewise, psoriasis, tinea, alopecia, and molluscum contagiosum.

Of rarer occurrence are pemphigus, ichthyosis, lupus, keloid, erysipelas, scleroderma, xanthelasma, and favus.

Lichen urticatus, or **strophulus**, the red gum and white gum sometimes talked of, occurs chiefly from the age of five or six months onwards through the period of dentition. It is not unusual from two to four years, but its history may then be traced from a much earlier date; and even in older children, of eight, nine, or ten, a persistent lichen urticatus is occasionally met with. As seen in infancy, it occurs as rather sharply raised, pale, rounded papules of a peculiarly hard or shotty feel, and often with a translucent centre, looking like a vesicle, but from which no fluid comes when pricked. The forearm, leg, and trunk are its favourite sites. It is very irritable, and associated often with urticaria, and for this reason the appearances vary, the characteristic papules becoming lost in wheals or changed into a number of bleeding or crusted points, from the excoriation produced by scratching. Closely allied to this disease and to urticaria is another, which has been called **urticaria pigmentosa**, or "xanthelasmoidea," in which the trunk more particularly becomes covered with yellowish-brown blotches, the skin at the affected spot being raised and thick, like soft leather. Urticaria wheals are frequently seen about the body, and the history is often that the pigmented thickenings have begun as such—a fact as to the truth of which I have on more than one occasion satisfied myself. This disease was first described by Dr. Tilbury Fox as "xanthelasmoidea," and a good many cases have since then been recorded.

Dr. Colcott Fox has given a careful summary of all these,* and in addition has added important information on two points—first, he shows that the disease tends to disappear as the child grows up; and secondly, that the microscopical structure of the affected tissue is that of a *wheal*.

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* *Trans. Med.-Chir. Soc.*, vol. lxvi.

It is important to recognise in all these three affections that the difficulties of treatment lie less in the actual structural changes in the skin than in the fact that all these children have what Mr. Hutchinson calls a pruriginous skin. The subjects of urticaria pigmentosa have not only a pruriginous skin, but also, like some cases of pemphigus, an excessive tendency to the deposition of pigment in the skin. It is the constitutional element, if it may be called so, which allows of lichen, while some slight disturbance is the immediate provocative. Most often this is gastric disturbance or indigestion during dentition; sometimes it is the irritation of fleabites; sometimes again, as Mr. Hutchinson suggests, a varicella or some other exanthem. Mr. Hutchinson distinguishes between a prurigo due to varicella and that due to other causes, by the former being vesicular, the latter not; but the presence of abortive vesicles, or appearances which resemble them, are so common in strophulus that I cannot think this distinction is of much service. Some exceedingly practical and valuable remarks, however, are made by Mr. Hutchinson, concerning the production of a pruriginous skin by eruptions of any chronicity. All must be familiar with the fact that to scratch an itching spot is not only to make that part more irritable, but also to extend the actual area from which the abnormal sensation is transmitted. It is easy thus to make the body itch all over; and this condition begets a pruriginous habit of skin which is quite out of proportion to the external cause.

Treatment.—Lichen urticatus is very obstinate. It and all three affections in this group are for the most part best treated by the strictest attention to the diet; but it is in many cases very difficult to say exactly in what element the cause of indigestion lies. Some children are said to be worse when eating sugar, some when they have taken too much milk; but I must confess to having been unable to reduce a not inconsiderable experience to concrete and dogmatic statements.

Having already given full space to diet, I shall only say that it will require careful scrutiny and probably modification according to the rules already detailed. Next in importance comes the necessity to deprive the surface as far as possible of all excuse for itching. This may be done both by external and internal means. Externally, the most scrupulous attention is to be paid to cleanliness. The skin is to be bathed and the linen is to be changed frequently, to ensure the absence of such pests as fleas and in hospital out-patients scabies and pediculi must be examined for and treated if present. The nature of the clothing next the skin must also be examined. Some people are unable to wear flannel, or particular kinds of flannel, merino, &c., and dyed flannels are sometimes in use, which may account for external irritation. The itching of the papules may be mitigated by gently rubbing over them and the affected skin a lotion of carbonate of soda, glycerine, and elderflower or rose-water (F. 48), or a lotion of corrosive sublimate—half a grain to each ounce—is sometimes effective (F. 49). Borax and glycerine may be used for the same purpose, or the skin may be oiled with vaseline or carbolic oil (1 to 40). Mr. Hutchinson recommends a solution of the liquor carbonis detergens (one part to four or five of water); Dr. Ashby, a lotion of glycerine plumb. acet. ʒij, liq. carb. deter. ʒij, and rose-water ℥vj.

For the more chronic cases, a tar bath may be given, by adding the liquor carbonis detergens to water; or sulphur baths are useful—a tablespoonful of sulphur, or more, to a bath, or sulphuret of potassium ℥ij to a bath.

For internal administration in the acute stages, bicarbonate of soda or potash may be given, or some fluid magnesia. Either of the F. 9–12 will answer the purpose.

For older children, quinine in full doses, and cod-liver oil, seem to be of most service. I think, also, that the confection of sulphur and euonymin are of value in regulating the bowels and stimulating the liver.

Acute Urticaria is far less common than the chronic conditions just described. It is readily recognised when the wheals are out, unless, as is sometimes the case, these are exchanged for a more or less general œdema, when the face becomes swollen like the visage of a child with pertussis, and the subcutaneous tissues of the extremities are rendered somewhat brawny. When the wheals are not out, there may be also a difficulty, very little remaining but small red papules, with perhaps—when the itching has been severe—a subdued ecchymosis or dusky condition of the skin.

Acute urticaria is certainly due immediately to errors in diet, though it is not unlikely that idiosyncrasy may be the remote cause. It is to be treated by attention to the diet, and usually some alkali, as in F. 9 or 12, is all that is necessary. To allay the severe itching bicarbonate of soda, dissolved in equal parts of glycerine and water, or glycerine and rose-water rubbed gently into the part, is one of the best remedies. So also is F. 48. Gentle friction with sweet oil is also useful, and perhaps, it is well to remark that whereas violent scratching increases the irritation, gentle rubbing is one of the best calmatives possible to a pruriginous skin.

Recently acute urticaria has become more common as a result of the use of antitoxic serum; in these cases the urticaria appears a few days after the injection of the serum, and seldom causes much itching: it subsides spontaneously after two or three days and requires no treatment.

Eczema is most commonly seen about the head, ears, and face, and in such other parts as are subject to chafing and to the irritation of excessive perspiration—in the creases of the neck, in the axillæ, groins, scrotal and anal regions, and round the umbilicus. It may be hereditary, perhaps not as eczema from eczema, but from a rough or scurfy skin, or an abnormality of some sort. Like strophulus, it frequently owns an external cause which may be slight in comparison to the amount of the disease. In hospital out-patients it is often associated with scabies and pediculi—in both cases the eruption may be not only vesicular but pustular—(eczema impetigo). Eczema capitis is sometimes very chronic, and is one of the most obstinate affections of young children. Such cases sometimes remain for months in hospital and seem to derive no benefit from any remedy, notwithstanding that the child's general health improves or may even appear to be of the best. There is a tendency to enlargement of the lymphatic glands with eczema, and if the eczema be pustular the glands may suppurate. Eczema has a distinct predilection for the first four or five months of life—twenty-five cases out of thirty-three, occurring in the first year of life, being under five months. Between one and two years the disease is common—ten cases in the thirty-six were over a year. From two to six years it is more evenly distributed, and after that it becomes uncommon. It is often attributed to vaccination; and I think it must be allowed that, although the charge may be a groundless one, nevertheless, in unhealthy children or those of pruriginous habit, it is occasionally excited by the condition which vaccination engenders. It may equally originate in a varicella, or after measles or any exanthem.

Treatment. Acute Eczema.—This must be general and local. In the main, it requires careful dieting, abstinence from starch and saccharine matters, and the internal administration of bicarbonate of soda or potash and nux vomica (F. 9). A powder of bicarbonate of soda (gr. v) is a useful combination, and may be readily given in milk three or four times a day. Small doses of the tincture of rhubarb, the tincture of podophyllin, or of aloes, or of euonymin (F. 14), may also be of service. A little hyd. c. cret. seems also to be useful in some cases; and all these children are the better for a tonic of tartrate of iron after the rash has disappeared. When there is much itching, a dose of chloral may be given internally, either at bedtime or occasionally repeated during the day; and Dr. Pye-Smith speaks highly, from his own experience and that also of Dr. Fagge and Dr. Eustace Smith, of the value of quinine in such cases. It is given as a single dose of half a grain, or a grain or more, according to the age of the child, an hour before bedtime.

In the treatment of all forms of eczema it is most important to prevent the child from scratching the part; for this purpose we know of no more successful method than that we have already mentioned; a piece of stiff cardboard is bandaged round each elbow to act as a splint fixing the elbow-joint in extension; this effectually prevents any scratching of the upper part of the body, and if necessary a pair of socks drawn over the hands and secured round the wrists will complete the protection.

For local applications, quite a number of things are useful at one time or another. In very acute cases, soothing applications, such as lead (or with opium, ʒij to ℥vj) lotion, will be required temporarily; but more generally the ung. metallorum (equal parts of the zinc, nitrate of mercury, and acetate of lead ointments) or some preparation of zinc. The zinc ointment is too thick; it may be made less so by the addition of olive oil, or made with vaseline in place of the benzoated lard, or the oxide or oleate of zinc may be lightly dusted over the affected parts, after they have been freely smeared with olive oil. Boric acid ʒss to cold cream ℥j is a useful application. So also the glycerinum boracis; and for parts which require to be dried in some measure, the oleate of zinc, scented with thymol (Martindale) or the sanitary rose powder, is a useful preparation.

In the more chronic and drier forms, arsenic and cod-liver oil are of most use internally; and, as local applications, creosote ointment, or an application of the oil of cade one part, and vaseline four parts, or of any strength that may be deemed necessary; or Lassar's paste (F. 51) may be tried.

For chronic eczema of the scalp, the local application of cod-liver oil is sometimes of use, in addition to the internal administration of the drug. But these are cases which require the utmost patience and perseverance.

In the eczema impetiginodes of the scalp, all that is usually necessary is to see to the destruction of all pediculi (p. 773), the removal of all dry crusts, by softening them with oil and poultices, and then the application of the ung. metallorum.

In the patches of eczema so common about the face, a little unguentum metallorum is the best remedy. To keep the ointment applied to the face where the eczema is extensive it is best to use a mask cut out of soft linen or of butter muslin, on which the ointment is spread; the mask is kept in position by bandages round the forehead and below the chin.

For intertrigo, the parts should be bathed two or three times a day with oatmeal or white of egg and tepid water, dried carefully with a soft towel, and then dusted over with the sanitary rose powder or oleate of zinc above mentioned.

Should these fail, one or other of the applications already mentioned may be tried. The parts should be covered up as little as possible. Soap should be avoided in eczema, except in very chronic cases, the bath being one of tepid water, with some fine oatmeal or white of egg added.

Children with a tendency to eczema require attention to their food and occasional tonics, more particularly for some weeks after an attack—a few drops of cod-liver oil twice or three times a day, or the lactophosphate of lime and iron (F. 17), combined with a little arsenic.

Sweat-rash.—In infants and young children it is exceedingly common in hot weather for a rash to occur over parts of the body where sweating is profuse. The rash, in some cases, consists only of minute vesicles, sudamina, but often there are red and brownish-red papules, and in some cases actual pustules. The rash is sometimes so thickly set and associated with so much hyperæmia of the skin that we have known it to raise the question of scarlet fever. Its distribution is most commonly over the root of the neck and the upper part of the chest in front, and at the roots of the hair over the forehead and behind the ears—a distribution which we have known to suggest measles—in some cases it extends all over the front of the chest and over the upper part of the arm, especially on its inner surface; it is much less frequent on the lower part of the body.

No treatment is required, as a rule, except to clothe the child more lightly; calamine lotion, or a dusting powder of zinc oxide and boracic acid with starch, may be used locally.

Impetigo is most common on the scalp, where it is very generally associated with pediculi. It seems very doubtful whether any distinction can be drawn between a "simple impetigo" and a contagious impetigo, but **impetigo contagiosa** has been described as a special form which occurs in epidemics, runs through a household, and is preceded by febrile disturbance; it is distinguished, in short, by the characteristics of an exanthem. Dr. Tilbury Fox states that he has "again and again reproduced the disease in others by inoculation," and it is by no means uncommon to find several children suffering from impetigo in one house. All this is fully in accord with what we know of the nature of the disease; it would seem that impetigo is due to an invasion of the skin by pyogenic micro-organisms, particularly the staphylococcus pyogenes albus and aureus; and, this being so, it is natural enough that infection should be conveyed not only from one part to another in the same child, but also from child to child; and no doubt the medium of infection in many cases is the purulent or sero-purulent exudation which contains the micro-organisms and which is readily conveyed by the fingers, which have been used to scratch an infected part. Impetigo contagiosa has been said by Dr. Tilbury Fox to begin as a vesicular disease, and thus to differ from other forms of impetigo, and also from pustular scabies, with which it may be confounded. But this vesicular beginning is probably common to all forms of impetigo, and is not at present generally accepted as distinguishing any particular variety. In this early stage the disease may be mistaken for varicella; and it must be remembered that, like eczema, it is liable to be set up by and mask scabies.

Treatment.—The contents of the pustules being inoculable, care must be taken to prevent the pustules being scratched, and to render the pus harmless.

If the disease affects the scalp and is extensive, it is better to remove the hair as closely as possible, apply poultices and oil to remove the crusts, and subsequently some unguentum metallorum to the pustular sores, and a weak carbolic oil to the rest of the scalp. When the sores have healed up then come free washings with soap and water, and perhaps some ammoniated mercury ointment (gr. v to the ounce of vaseline), to get rid of the pediculi. Impetigo may occur in other parts of the body as scattered pustules or scabs, and wherever it occurs is usually speedily cured by the application of an ointment of ammoniated mercury. In many cases the disease indicates that the child is out of health, that it is fed too well or too ill, or wants change of air or tonics.

Ecthyma occurs in unhealthy children, who usually require tonics and cod-liver oil. The crusts which form on the sites of the bullæ of pemphigus may look like ecthyma in some instances, and the fact should be remembered. The unguentum metallorum is a good local application.

Furunculi, or **boils,** are common at all ages, but they are chiefly met with in young children from one to three years, and in boys of eight to ten or twelve. In the younger subjects they are more prone to appear as red brawny indurations, and to run a rather slow course. Boils are often exceedingly troublesome —not so much in the cure of any one, although this is no light matter, for the pain and depression caused is quite out of proportion to the size of the local malady—but in the fact that certain individuals are subject to them, and when one breaks out it may be followed by others, and the illness extend over some weeks; not only so, but the skin, under these circumstances, is in an irritable condition, and, unless great care be exercised, the original boil becomes surrounded by a number. This is more particularly the case where poulticing has been carried on with vigour.

In adults, boils are often the result of over-feeding, and some of the most intractable cases I have met with have been in large eaters of meat; in some they are an indication of sugar in the urine, but in children this is not so. A deteriorated state is generally indicated, which requires more generous living and sometimes stimulants. Occasionally the boils refuse to disappear, except under change of air. They may occur on any part of the body, but the back of the neck is the more common seat, or the buttocks. I have, in particular instances, thought them due to sanitary defects in the house or its immediate vicinity.

Treatment.—Every household either has, or can learn from its nearest neighbour, a recipe both for plaster and nostrum for the speedy cure of boils, but there is nothing that can be said to show a large percentage of successes. Hebra's ung. diachyli is a good application. Locally, the inflammation must be shielded from all irritation (the pain it gives, however, ensures this), and the part may be kept moist by lead lotion, or supple by vaseline or carbolic oil. In the early stages, the removal of the small head, and the insertion of a minute drop of the Pharmacopœial glycerinum acidi carbolici, sometimes eases the pain and arrests the extension of the slough. Poultices and cold-water dressing, though in many respects grateful, are dangerously liable to provoke the appearance of more. As internal remedies Dusart's or Easton's syrup may be given, and maltine or stout. For growing boys of ten to fourteen or more a mid-morning meal of half a tumbler of stout, with some bread and butter, is a very good pick-me-up.

Sulphide of calcium has been recommended as especially valuable, but on two rather contradictory grounds: one will tell you it is effective in procuring resolution, another as a means of bringing about softening and evacuation. I have sometimes thought it of use in the latter way, but it has often failed, and I am not sure of its value. In general terms, we must look out for any faults in diet, or faults in hygiene, and then, having remedied these, betake ourselves to general tonics, such as I have named, and to maltine or stout as a food.

Bromide Eruption.—This is known at sight by those who have once seen it, but it is not common. The appearances are most peculiar. Large fungating bosses of dryish red warty granulations rise sharply from skin which is apparently healthy, or which has but the thinnest line of inflammation surrounding them. The masses look sore, yet do not discharge much, and they are more like condylomata than any other affection. A very similar eruption sometimes results in adults from iodide of potassium, but I have never seen it in children. The far commoner papular or acneiform rash may be seen at any age, either from iodide or bromide, although I should not say that this is common in children. The condylomatous form of the disease is a severe localised dermatitis, and usually breaks out, if at all, after a prolonged use, but it has been known to occur after the administration of but a few grains of the drug.

Treatment.—The drug must be at once discontinued, and the part treated as any local ulcer might suggest. It has been stated that the combination of arsenic with the bromides mitigates the tendency to the outbreak of this affection. The eruption is tediously slow in disappearing. I have known it to last as dried-up crusts for four months. The disappearance of the warty granulations may be hastened by the application of salicylic collodion.

Herpes is most commonly seen round the mouth. Its usual appearance is that of a collection of crusts, the vesicles characteristic of the disease having become abraded and dry. It is often associated with ulceration of the gums, and is liable to accompany acute febrile disturbance of any sort. It is, however, very commonly seen in the out-patient room in conditions of feeble health, without any certain evidence of the pre-existence of fever.

Herpes Zoster, or shingles, is also common. It occurs as a crop of vesicles containing neutral or feebly alkaline fluid, mapping out an area which corresponds roughly with the distribution of one or other of the cutaneous nerves. Such was the view which was until recently supposed to explain the curious distribution in cases of herpes zoster, and on this view the parts affected in ten cases were, the region of the superficial cervical plexus in two, that of the ilio-inguinal, lumbar, or cutaneous nerves of the thigh in four; of the internal cutaneous of the arm in one; of the intercostal nerves in three. But within the past few years the researches of Head and Campbell have made it probable that the distribution of herpes zoster follows rather the fibres from the posterior root ganglion, and that the essential change is an inflammation of the posterior root ganglion. The right side was affected seven times. Six were boys, and four girls. The administration of arsenic seems to determine an outbreak of herpes zoster in some children, we have seen this association many times.

The complaint is, in my experience, as has also been stated by others, more common in children than in adults. It is said to occur only once in each individual; a statement I can neither confirm nor confute.

It is a disease which is associated with more or less pain for a few hours before and during the formation of the vesicles; but this usually quickly ceases, the vesicles dry up, though remaining tender, and in four or five days the disease is all but well. The associated and lingering neuralgia so well known in adults does not occur in children.

Herpes Iris is rare: it is said to occur most frequently in the extremities, rarely on the face. In the two cases of which I happen to have notes it occurred in the latter situation. It is recognised by a central vesicle, with secondary rings of vesicles, and more or less redness around them.

Treatment.—Very little is required for any form of herpes. Some mild saline laxative may be given for a day or two, and, if the pain be severe, a small dose of opium: the saline is to be followed by a tonic. The eruption may be treated by the application of some thick ointment, such as the unguentum zinci, which in a measure protects the vesicles from friction, and thus eases the pain and gives time for them to shrivel; or they may be kept well powdered with the sanitary rose powder, oxide or oleate of zinc; or they may be painted with flexible collodium. The part should be well covered with wool.

Pemphigus is a not very uncommon disease in childhood. Two forms require mention—pemphigus neonatorum, and pemphigus occurring in children other than sucklings.

To take the last first: it occurs usually in spare children, and, if extensive, may be associated with very obvious ill-health; but, this is not necessary. Its course is apyrexial in many cases. In three cases taken from my note-books, one is a spare girl, but not in any strikingly wasted condition, nor by any means anæmic; another, is a remarkably well-looking, stout country boy; and the third, a boy—the disease having lasted for many months, as it is likely to do—is somewhat anæmic and thin.

In all these cases there comes upon the healthy skin a patch of erythema. This may be bright red from excessive injection of the cutaneous capillaries, or a paler, more coppery tint. The patch becomes slightly raised, the cuticle becoming partially separated, and giving it a wrinkled, soft, leathery appearance. After this a full or flaccid bulla forms upon a slightly vascular non-indurated base, containing opalescent serum or thin puriform fluid. The vesicles rupture and dry after a certain time of tension, or gradually shrivel with a dry crust forming in the centre. Ultimately the whole surface originally blistered becomes coated with a thin crust, which covers a superficial ulcer. This gradually heals, and leaves behind it a brightly rose-coloured or a coppery stain.

Under arsenical treatment the blister formation is either entirely arrested or rendered abortive. In the latter case I have seen the trunk and extremities (legs particularly) covered with coppery patches of slightly thickened skin, not at all unlike a condition of tinea versicolor on superficial examination.

It is a disease which is very prone to relapse and to recur through several years, but according to Mr. Hutchinson, it is cured eventually under arsenical treatment. I have had two cases under my care which strikingly illustrate the tendency to relapse, the intractability as regards *complete* cure, but the ready *temporary* cure under the administration of arsenic—a boy of five and a half, who has been in the hospital twice, with an interval of some months, and who has been under medical treatment more or less for many months; and a girl of seven, who has been under continuous treatment for fifteen months. Small doses of arsenic are of little use to them, but as soon as fifteen- or eighteen-minim doses are reached, the blebs shrivel, and no fresh ones appear. But here comes the difficulty; a less quantity fails to check the formation of vesicles; the large one, when continued for ten days or a fortnight, causes diarrhœa and vomiting, and necessitates its discontinuance.

Pemphigus neonatorum is sometimes a disease of like character to that just described. It then appears as scattered bullæ in various parts of the body, avoiding the soles of the feet and the palms, and but rarely affecting the scalp. Bullæ have occasionally been seen upon the gums and mucous membrane of the mouth.

Generally, however, it is more acute and more diffused, sometimes being of the nature of a general dermatitis, and is frequently of syphilitic origin. Syphilitic pemphigus is particularly prone to affect the soles and palms.

The descriptions of pemphigus vary much. One can therefore only suppose that the disease varies in its symptoms. Thus, a cachectic form is described by some, because it occurs in unhealthy children, a pyæmic by others, because it occasionally indicates some bad condition of the blood; some have witnessed a contagious form; epidemics have occurred in some maternity institutions, and it is described as being sometimes associated with fever, sometimes not.

As regards the last point, the girl already alluded to has occasional fits of pyrexia; but they have no definite relation to the outbreak of the eruption; they rather seem to be dependent upon the disturbance which this induces, for the eruption is often severe and distributed.

Diagnosis.—This is for the most part not difficult, for the existence of scattered blisters determines it. But when, as may happen, the bladders have dried and crusted, or the disease is acute and diffused, and the body is covered with eczematous-looking crusts, one may well hesitate before coming to a conclusion. A bullous erythema is occasionally seen, which is very difficult to differentiate.

Prognosis.—This is only grave in young infants, or in the diffused forms in cachectic, pyæmic, or syphilitic infants.

Treatment.—English authorities now very generally assent to the doctrine that arsenic is curative of non-syphilitic pemphigus. Abroad, opinion is by no means unanimous, and, by many, general tonics and blood restorers, such as cod-liver oil, iron, &c., are preferred before other remedies.

The evidence collected by Mr. Hutchinson in favour of arsenic is very strong. Its value has been attested by a large number of other observers, and so rarely does it fail to relieve, and, eventually, to cure the disease, that it may fairly be called *the* treatment for pemphigus. Other means for improving the general health may well be resorted to at the same time, and, while such things as cod-liver oil and iron are given generally, good food and fresh air should be provided also.

For syphilitic cases anti-syphilitic remedies, such as hyd. c. cret. or iodide of iron, are to be given internally, or a mercurial bath may be given externally, of a strength of two, three, or four grains of perchloride of mercury to each gallon of water.

The blebs may be powdered over with boric acid or oleate of zinc, to encourage their shrivelling, drying, and healing.

Psoriasis is often hereditary, and is also probably related more or less closely to the rheumatic diathesis. It presents similar features in childhood to those of the disease in adults, and it is for the most part relieved by similar remedies, viz., the local application of tar soap and tar ointments, and the internal administration of arsenic; but it is an intractable form of disease. The sapo carbonis detergens, or terebene soap, is good for these cases, and the oil of cade, one part to three of vaseline, with some oil of lavender, makes a serviceable ointment; as also does liq. carbonis detergens ʒj to vaseline ℥j to ℥ij. The ung. acidi chrysophanici (ten grains to the ounce of benzoated lard) is also a useful remedy, but must be used with care, as it sometimes produces œdema, and some slight local inflammation of the part to which it is applied. It also stains the skin and linen, but the colour can be removed by benzol or weak solutions of potash (Martindale). Martindale's pigmentum acidi chrysophanici is a useful form of application.

Erythema may assume various forms, and is very common in childhood.

Enema rash forms one variety of erythema, which is not at all uncommon in children.* It appears generally about twelve to twenty-four hours after the administration of an enema. Its cause is uncertain, but in almost all the cases we have seen soap has been used in the enema, and it is perhaps commoner with some sorts of soap than with others. The usual appearance is a slightly raised, bright-red rash, consisting at first of small round areas, which run together to form irregular blotches. The front of the knees, the back of the elbows, the buttocks, and the face are the usual places in which it appears, but it may spread to the rest of the limbs and trunk. It disappears usually in forty-eight hours, or even less. There is no itching as a rule, but sometimes it is said to cause very slight irritation at its first onset. The rash is not urticarial. Constitutional disturbance is entirely absent and there is no rise of temperature.

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* *Clin. Soc. Trans.*, vol. xxxii.

Another more important form of enema rash sometimes occurs, consisting of a diffuse erythema, very like that of scarlet fever; usually, however, it is more coarsely punctate, and tends to affect the face more than scarlet fever does; moreover, it lacks the constitutional symptoms. There is reason to believe that there may even be some desquamation after these rashes, so that the diagnosis from a mild case of scarlet fever may be difficult and when there is any doubt it is well to be on the safe side, and take all precautions against infection. No treatment otherwise is required.

A wandering erythema, of erysipelatous nature, is not uncommon in young infants in out-patient practice amongst the poor. The skin and subcutaneous tissue are the prey of a metastatic œdema which flits from spot to spot. It is, in my experience, almost always fatal even when—and this is not rare—the constitutional disturbance is hardly apparent. The disease is probably of septic nature, and attention should be given to the condition of the umbilical sore; and the general hygiene of the house should be made the subject of special inquiry.

Erythema nodosum is not uncommon. It is characterised by raised and tender lumps, which appear most often about the legs, on the front of the shin, and about the calf. They are not so very infrequent over the extensor surface of the forearm. They are sometimes seen also over the thighs and buttocks, and even on the face, but they are very rare here. The lumps quickly change colour, and pass through the phases of discoloration of a bruise, and gradually disappear. Erythema nodosum is often associated with other forms of erythema, and has thus received the name of "erythema multiforme." The disease occurs in rheumatic families, though not exclusively so (nineteen out of twenty-nine cases, see p. 662). It is usually attended by apparent ill-health, but the temperature is hardly raised. In some cases, however, there is severe constitutional disturbance, with pyrexia.

It is but seldom necessary to apply any local treatment, but, after paying attention to the bowels, a tonic of iron, or arsenic, or strychnine should be given.

Sclerema Neonatorum is an extremely rare disease in this country. It appears to be a disease of the new-born amongst the poor of large towns, and to be more common in the winter than the summer months.

The characteristic change is a hardening of the subcutaneous tissues, so that they feel very much as if the fat had become solidified, and it is difficult to pinch up the skin from the deeper parts. This induration begins during the first month of life, and is usually seen first on the back of the body, on the buttocks or thighs, and thence tends to spread over the rest of the body. The affection may be quite patchy in its distribution: we have seen cases in which there were several small areas in various parts of the body, each having a sharply defined margin. In some cases the indurated areas have a pale bluish-pink colour. There is no pitting on pressure. This curious "hide-bound" condition has been preceded in some cases by an extremely low temperature in the infant, and some have believed this to be the cause of the condition, the body heat not being sufficient to keep the fat entirely liquid. According to others, however, the actual changes found are atrophy of fat-cells and either real or apparent increase of subcutaneous fibrous tissue.

In some cases, as the induration spreads, the body heat sinks, the pulse becomes imperceptible, the heart-sounds almost inaudible, and maybe the respiration is invisible. The infant thus becomes excessively feeble, sucks little, takes little from the breast, and sinks.

But the outlook is by no means always so gloomy. Dr. A. E. Garrod has recorded two cases which recovered,* and refers to others. In these cases the sclerematous patches gradually became smaller, softened, and split up into smaller islets of induration, which completely disappeared.

Various applications have been used in the successful cases; cod-liver oil, camphorated oil, and unguentum hydrargyri have all apparently acted equally well. Internally, probably cod-liver oil is the most useful drug, but grey powder has also seemed to do good.

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* *Clin. Soc. Trans.*, vol. xxx.

Gerhardt, attributing sclerema in great measure to lowering of the body temperature in feeble premature children, insists on the importance of careful feeding either by wet-nursing or otherwise, and all such means as will raise the temperature—warm baths, hot packs, and incubators.

Œdema has been confused with sclerema, from which, however, it differs considerably. The skin in œdema, unless it be extremely tense, pits on pressure, whereas, as Dr. Garrod has pointed out, the skin in sclerema does not pit even when the induration is passing off. Œdema, moreover, begins commonly in the feet, the hands or the eyelids. Œdema, however, resembles sclerema in its tendency to occur in feeble puny infants, and to be associated with a subnormal temperature. The causation of the œdema is obscure; in the new-born it is often associated with much atelectasis or weakness of the heart, in other cases it may follow erysipelas, or perhaps be the symptom of nephritis in early infancy. Henoch mentions such a case at four weeks old.

Scleroderma.—I have seen several examples of diffused scleroderma in children of six to ten years of age, and one case, a boy of seven years, under the care of Mr. F. D. Atkins, of Sutton, is of especial interest, because it followed directly upon albuminuric dropsy after a sore throat and eruption of doubtful nature, but unlike that of scarlatina. The disease, however, does not differ apparently from that of adult age.

Ichthyosis, though rare in its extreme form, is not uncommon in its milder degrees. It is congenital, and sometimes reaches an extreme degree in the fœtus, such cases being stillborn or dying shortly after birth. The condition, may, however, scarcely attract notice until some weeks or months after birth; the skin is merely rough, reddish and dry, and the parents think little of it. But as the child grows older the skin becomes drier and more scaly, the epidermis is thickened, sometimes enormously, with deep furrows in it, dividing it in some cases into irregular areas like the hide of an alligator. Owing to accumulation of grease and dirt, the epidermis is darkened, so that where the condition is extensive the child has a curious blackish-brown colour all over. Often, however, the thickening of the epidermis is considerable only in isolated patches, particularly on the fronts of the knees and the backs of the elbows: in these cases the skin over the rest of the body will be found to be dry and harsh. Such a dry condition of the skin is by no means uncommon in children without any localised heaping up of epidermis, and constitutes the condition known as **xerodermia.**

Treatment is unsatisfactory. In the marked cases of ichthyosis daily warm baths with soap and gentle scraping will completely remove the thick scales of epidermis, and by the application of some oily preparation or of glycerine the skin may be kept soft. But the improvement continues only so long as treatment is persevered with; a few weeks of neglect and the condition is as bad as ever. Fortunately, except in the very extreme cases which die in early infancy, the condition seems to have little effect on general health.

Seborrhœa is an affection of the sebaceous glands, and, as affecting the scalp, it is not uncommon in infants leading to a thick caking of the scalp, usually about the front, and to a secondary dermatitis; whilst in older children it occasionally produces a condition of intolerable scurf. In the former class of cases the crusted material must be softened by carbolic oil and poultices, and then removed—the further reaccumulation of material must be prevented by plenty of soap and warm water, and, if necessary, friction of the scalp with unguentum myristicæ or some other mild stimulant. In older children, the hair should be kept short, be frequently well washed with soap, and the scalp stimulated by being well brushed at least twice a day. Oily applications, such as weak carbolic oil or vaseline scented with oil of lavender, are useful, inasmuch as they prevent the accumulation of the natural secretion, and thus make for a more healthy condition of the affected glands. Boric acid in glycerine or as an ointment with cold cream is also useful in the same way, and acts, moreover, as a mild stimulant.

There are various other affections of the skin which might be mentioned, but they are rare—I might say unimportant—and may well be left to special works on the subject. I will only mention **Keloid** as not uncommon in vaccination scars, and therefore affording opportunity for the study of the natural history of a form of tumour of a very remarkable sort, in that it generally disappears spontaneously.

Molluscum Contagiosum also, as a form of glandular tumour, occurring about the face, neck, chest, genitals, &c., which many assert to be contagious, is a disease which, insignificant in itself, is of great pathological interest. It is easily eradicated by nipping off the little masses with the nail, and by, if necessary, applying some mild astringent, or touching the bases with caustic.

Congenital Xanthelasma may also find mention, in that it may help, though of very exceptional occurrence, to a clearer knowledge of a still obscure disease in the adult.

There yet remains the important group of parasitic diseases. These are tinea—with which I shall say what is requisite concerning favus—scabies, and pediculi.

Tinea is rare in infants, but it is occasionally seen even in sucklings. It is very common in older children. It occurs in two forms—the body tinea (tinea circinata), when it appears as a red, scurfy, gradually spreading ring on face, neck, arms, or other parts ; and the scalp tinea (tinea tonsurans), which requires a more detailed description. It was formerly thought that both these forms were due to one and the same fungus, but of late years it has been shown that under the term "tinea" there have been grouped together several conditions which are quite distinct in their causation. The disease, both on the scalp and on the body, may be due to a different fungus in different cases ; and these fungi have been distinguished partly by the size of their spores and by the manner in which they invade the hairs, and partly by their cultural characteristics. The commonest cause of scalp ringworm in children in this country would seem to be the small-spored fungus, microsporon Audouini, whilst in many cases of body-ringworm there is found a large-spored fungus, which has been distinguished as megalosporon, or endothrix ; other varieties of fungus are found much more rarely. The spores are seen microscopically as strings or thickly clustered masses, which have been compared to fish-roe, and which are indestructible by liq. potassæ or by ether (the latter distinguishes them from small globules of fatty matter, which sometimes make a difficulty in diagnosis for the student).

Ringworm occurs in the scalp as isolated patches, which are, perhaps, more or less bald; or diffused, without any absolute baldness anywhere. The scalp often presents the appearance of eczema or seborrhœa, and sometimes, though rarely, there is pustulation. The characteristic of the disease is the existence at any part of short bristly stumps, or hair follicles, with a central black dot (which is the hair broken off quite short), or the empty orifice occluded by dust, or persistently barren, though slightly swollen hair follicles. The isolated patches are often red or scurfy; but the diffused disease is very difficult to detect, unless the scalp be most carefully examined, and the short stumps of broken-off hair be made the special object of search.

As regards the **diagnosis** the disease is so common and so often overlooked, that a diseased scalp of any kind should always be examined with the possibility of its existence in view. Scurfy heads particularly require this, as the stumps are liable to be hidden beneath the scales. The scalp must be examined methodically, the hairs being turned up with a pair of forceps, and the roots examined with a lens. Any suspicious stump must be (as much of it as possible) extracted, and the minute fragments examined under the microscope, after adding a drop of liquor potassæ to clear the parts.

Prognosis.—Recent cases are for the most part readily curable under energetic treatment; when the disease has existed some months, it may be very intractable. Even recent cases, however, require a guarded opinion upon the speediness of recovery, for some children appear to form an unusually favourable soil for the growth of the disease, which spreads with great rapidity, notwithstanding treatment. It is impossible to say what the conditions of the child may be which favour the growth of tinea. The late Sir Erasmus Wilson believed that they were those of a depressed vitality which required extra food, and tinea is no doubt often found in thin anæmic children; but there is equally no doubt that it is not uncommon in those who appear to be in very good health.

Treatment.—I shall only give a bare outline here. For fuller information the reader cannot do better than refer to Mr. Alder Smith's little book,* than which nothing could be more simple, precise, and admirable, and from which, fully convinced of its value by personal experience, I condense much of the advice which follows. Tinea upon the body is readily cured. Hyposulphite of soda (ʒj ad ℥j), boric acid dissolved in glycerine iodine liniment, perchloride of iron, citrine ointment, and oleate of mercury, are all effective. Tinea upon the scalp is a much more troublesome affair, because the fungus dips down into the hair follicles, and invades the hair itself. It is therefore difficult to get at the fungus, and of course this difficulty is proportionate to the duration of the disease. Dr. Milne, Medical Officer to the Barnardo Homes, finds thymol one part, methylated chloroform four parts, and olive oil twelve parts, as good as anything, and he does not find it necessary to separate the children.

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* "Ringworm: its Diagnosis and Treatment."

In all cases the hair upon and for half an inch around the patch is to be cut short. If the disease is at all extensive, it is to be cut to a two-inch length all over the head, a fringe being left back and front for the sake of the appearance.

In recent cases the head is to be washed every morning, or every other morning, with carbolic soap, then well mopped with a lotion of hyposulphite of soda (ʒj to the ℥j). The actual patches may be blistered with glacial acetic acid, and afterwards some parasiticide applied—glycerine of carbolic acid, one in five, is a good one; but Alder Smith recommends, above all things, an ointment of nitrate of mercury, sulphur, and carbolic acid (F. 50), which must be well pressed into the roots of the hair follicles three times a day. Carbolic acid, one to ten, or F. 52, are good applications for the entire scalp. Epilation should be practised over the diseased parts.

When the disease is extensive, a weak ointment must be applied all over the head. If the head should become sore, the parasiticide is to be applied by painting only.

In **Chronic Ringworm** the fungus will have reached the depth of the hair follicles, and be more or less inaccessible to the effects of the parasiticide. Under these circumstances stronger remedies become necessary, and oleate of mercury appears to be one of the best applications. In children over ten, a 10 per cent. solution may be used; under five, a 5 per cent. solution. The oleate is to be well pressed into the diseased patches with a firm mop night and morning, the rest of the head being smeared with either carbolic oil or the weak compound ointment already mentioned (F. 50). If the disease is extensive, the oleate must be rubbed into the entire head. The head must not be washed oftener than once in ten days under its use: frequent washing impedes the penetration of the remedy. The hair must be kept short. This treatment will require to be continued for some time, often for several months. Mr. Alder Smith states that it is extremely rare for any ill effects to follow the use of the mercurial.

In cases which resist even this treatment, the artificial production of kerion is recommended. This is, in short, the production of an œdematous inflammation of the scalp in such patches as are diseased. It must be done very cautiously, and only a small patch at a time, and the parents should be informed of the aim of the treatment.

Croton oil is an efficient remedy for this purpose. This is painted on night and morning, and the part poulticed assiduously. In four or five days time the scalp thus treated should be red, swollen, boggy, tender, and the stumps protruding from the swollen follicles. Epilation is then to be carried out, and carbolic oil, citrine and sulphur ointment, thymol, or some other parasiticide is to be applied to the surface.

Water-dressing or weak carbolic oil may be applied to the parts until the inflammation subsides, when usually the disease is cured, and a smooth, shining, bald patch results. Some stimulant hair-wash is then to be rubbed into the bald patches night and morning, and the hair is soon reproduced. This treatment is severe, should never be applied to young children under seven or eight, and only in cases where energetic treatment of milder fashion over a long time has failed to eradicate the disease.

Other forms of treatment for ringworm might be mentioned by the score. I will, however, give the details of two methods which have of late been recommended, and which have their merits. The first is that by iodine and turpentine, advocated by Dr. Foulis.*

The hair is cut short, and the head well washed with carbolic soap of 10 per cent. strength. The diseased patches are then rubbed with turpentine by the finger for three or four minutes, until the part begins to sting, when tincture of iodine is painted on in two or three coats. The turpentine removes the grease from the scalp and follicles, and allows the iodine, which is a powerful parasiticide, to penetrate and reach the fungus. It should be applied every night, or every night and morning in severe cases; and is said to give no pain even to the youngest child. I have, however, found it cause considerable pain at times.

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* *Brit. Med. Journal*, 1886, vol. i. p. 563.

The other treatment is that of Dr. Harrison, of Bristol.* He has an ointment which is thus compounded:

Caustic potash	gr. ix
Carbolic acid	gr. xxiv
Lanoline,	
And oil of cocoa-nut, āā . . .	℥ss

Ft. ung.

Scent with oil of rosemary, lavender, or cloves. A small piece is rubbed on the *affected parts* night and morning. It is better not to shave the hair, but to leave it a quarter of an inch long.

As a preventive to all heads when ringworm has broken out, Dr. Harrison advises the following to be used as a pomade:

Ung. boracis,	
Ung. eucalypti, āā	℥ij
Oil of cloves	ʒss
Oil of cocoa-nut to	℥vj

Make pomade.

Any account of the treatment of ringworm at the present time would be incomplete without reference to the use of X-rays, which have recently been applied to this purpose with considerable success. Dr. Whitfield who has used this method in several cases at King's College Hospital, tells us that two or three applications may be sufficient, the hair over the area of application then falls out leaving a bald patch over which a new growth of healthy hair appears in about ten weeks.

Ringworm is very liable to relapse, and no child should be considered cured until the new downy hair is growing well and no stumps are to be seen, and this after several examinations made at intervals.

Preventive Treatment.—The disease is contagious, and liable to spread in families or schools; therefore all brushes, combs, sponges, flannels, towels, &c., used by the infected must be scrupulously kept separate, and no other child allowed to touch them. Caps, coats, comforters, &c., must be kept quite separate, and well baked when no longer needed, or, still better, destroyed; all linen that will wash should be well boiled. The heads of all other children in the house should be well pomaded with a white precipitate ointment, scented so as to render it agreeable (F. 52), or with carbolic oil (1 to 10), or with the ointment given above. They should also be frequently washed, and examined once a week, so that no early spots may go undetected. Recent cases, or any in which the disease is extensive, should be isolated. In the very chronic cases, if the disease is well in hand, and the head effectively covered with a parasiticide, the child may, if it be imperative, mix with other children, without much fear of the disease being communicated. It is, of course, better, when possible, to isolate the child until it is well. No boy should be sent back to school unless he be absolutely well, or the disease be well under treatment and the medical officer consents to his return, it being, of course, fully understood that continued supervision and treatment will be necessary.

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* *Brit. Med. Journal*, 1889, vol. i. p. 466

Alopecia Areata is placed here because so much discussion has taken place as to whether it is or is not due to the growth of a fungus, and because, if it be not, it is a condition which might be mistaken for ringworm. The fact that authorities have hitherto been divided upon the parasitic nature of this affection seems to me to point unmistakably to the conclusion that there is a disease (alopecia areata) which is non-parasitic, and that ringworm sometimes puts on very much the same appearances. The majority of living dermatologists are of opinion that alopecia areata is not due to a fungus. Alopecia is of various kinds, and any one of them may be found in childhood; but the disease which occurs in patches is apparently distinct from others, although the condition of the hair is, equally with them, one of simple atrophy. The cause of this atrophy is unknown; it is said to be sometimes hereditary. The hair falls out in patches, which increase at the circumference, and sometimes the entire scalp becomes bald. It is a common disease of childhood, and is treated—and as a rule successfully—by stimulant applications to the scalp. The expressed oil of nutmeg, well rubbed into the patch night and morning, is a good remedy. Another favourite prescription is tincture of cantharides, carbonate of ammonia, spirit of rosemary, and water (F. 53). Tincture of iodine may be applied, or, if the case prove obstinate, a patch may be gently vesicated, if not too large, by blistering fluid or iodine liniment. Steiner quotes Rindfleisch as recommending a lotion of tincture of capsicum and glycerine, and it is one that I should think would prove useful. The child will probably be benefited by tonics and good living.

Of **Favus** no lengthy mention is required, it is so rare. I have seen it only four or five times. Kaposi notes its occurrence fifty-six times in a total of nearly 26,000 cases of skin disease in a period of ten years. It appears as crusted cups of sulphur-yellow colour scattered over the scalp, and can scarcely be mistaken; it has, moreover, a curious odour, suggestive of mice, which is very characteristic. In very long-standing cases the crusts may, perhaps, be mistaken for those of some other disease —psoriasis, neglected eczema, seborrhœa, &c. The patches are more or less circular, of well-marked outline, situated round one or more hair follicles, and when removed leave a moist depressed red surface of skin behind. Favus sometimes occurs upon the body, and sometimes affects the nails.

The **treatment** is expressed, in short, by epilation, and the energetic application of some parasiticide afterwards. The ointment already given for tinea tonsurans may be recommended. Kaposi states that it is unnecessary to epilate the hairs systematically all over the diseased area; all that is needed being to take the hair in thin tufts—healthy and diseased indiscriminately —between such a thing as a spatula and the thumb, and then to make a slight traction. By this means the diseased and loose hairs come away and leave the healthy behind, without causing pain. Any cakes of fungus must first of all be removed by the free inunction of oil, and by poulticing, and the parasiticide is to be rubbed in after every epilation. The disease is intractable, and requires long treatment.

Scabies is a common ailment in the out-patient rooms of children's hospitals. It is often generalised over the body, it is often pustular, and it may be associated with an eruption of an eczematous appearance. It may in some cases be mistaken for eczema or impetigo, both common diseases of children: and it is also not easy to distinguish at first sight from lichen urticatus or strophulus, if the latter be very diffused and the skin scored by scratching.

The **diagnosis** must be settled by detecting the acari. Should the burrows prove difficult to find, any eczematous crusts may be scraped and detached, and examined under the microscope for fragments of the acari, or ova.

The **treatment** consists of applying some parasiticide to the affected parts, and afterwards thorough bathing—the infected clothes being well boiled or baked. Sulphur is the commonest remedy; half a drachm to an ounce of vaseline makes a good application. The late Dr. Tilbury Fox recommended an ointment of sulphur, hyd. ammoniatum, and creosote (F. 54). Iodide of potassium ointment is said to be very efficacious, and has the advantage of having no smell. To pustules and inflamed parts a soothing lotion, such as lotio plumbi must be applied. When the disease is generalised, time is saved by rubbing the sulphur ointment into the whole surface, the child remaining in a well-sulphured shirt and sheets for forty-eight hours. A thorough bath is then given and clean clothing put on. But this plan can only be followed when the skin is sufficiently sound to allow of it; it is not advisable in eczematous or pustular conditions. It will then be necessary to single out such parts as admit of and require the parasiticide, and others for the emollient treatment.

Pediculi are mostly seen in the head. As a broad rule, enlargements of the glands in the segment of the neck behind the ears are caused by impetigo of the scalp, and impetigo is almost always associated with pediculi. Pediculi are often present without the pustulation; but, given the existence of the latter, the former will generally be found. They are for the most part recognised by the existence of the ova on the hair; which are readily known by their elongated shape and their adhesion to the hair.

Treatment.—The hair should be thinned as much as possible: in boys it may be cropped to the head. If the head is not sore, the hair may be bathed with vinegar and water with the object of loosening the cement which keeps the ova in position, thus allowing of their removal by subsequent washing with soap and water, but no solvent of this kind is very successful.

The ung. hydr. ammon., either undiluted or mixed with vaseline, and scented with oil of lavender, is, perhaps, upon the whole, the best parasiticide. Some prefer a lotion of bichloride of mercury (two to four grains to the ounce), and benzol is recommended by others: but the ointment is, perhaps, safer than the one, and less repulsive than the other. Pediculi are not usually troublesome to eradicate, when once attention is directed to their existence. It perhaps more often happens that parents apply one thing after another to cure a sore head, and take no radical measures against the pediculi, which are at the root of the mischief. When they are few in number, a fine comb and frequent washing with soap and water will easily remove them.

One other point needs noting—viz., that pediculi are not always due to uncleanliness. It is no unfamiliar experience that the heads of patients in every way well tended may, as it were suddenly, swarm with vermin when disease has reached the stage of exhaustion preceding dissolution; and as has been said already of tinea, so is it with pediculi, that ill-health of any form, but particularly the thin miserable starveling is, with exceptions, the prey of these creatures of vulturous propensities. Fattening food and tonics are therefore very usually requisite in these cases.

APPENDIX I.

FORMULÆ.

1.

Carbonate of ammonia	gr. xij
Ipecacuanha wine	ʒj
Glycerine	ʒss
Caraway water to	℥jss

One drachm three times a day.

For bronchitis, p. 336; broncho-pneumonia, p. 370; coryza with dentition, p. 33.

2.

Spirit of ether	♏iijss
Aromatic spirit of ammonia	♏iijss
Tincture of orange peel	♏ij
Chloroform water to	℥j

Three or four times a day.

For bronchitis, p. 336, 725; broncho-pneumonia, p. 370; as stimulant, in erysipelas, &c., p. 304; in syphilis, p. 760.

3.

Salicylate of soda	ʒj
Liquid extract of liquorice	ʒss
Solution of acetate of ammonia . . .	ʒss
Water to	℥ij

Half a drachm to one drachm every three or four hours.

For fever with dentition, p. 33; rheumatism, p. 680; gastric catarrh, p. 135; diarrhœa, p. 93.

4.

Castor oil	ʒij
Oil of sweet almonds	ʒij
White sugar	ʒij
Powder of gum acacia	ʒj
Cinnamon water to	℥iij

Two drachms for a dose.

For diarrhœa, p. 94; constipation, p. 77; colic, p. 76.

5.

The same with three drops of tincture of opium in the three ounces.

One or two drachms for a dose.

For colic, p. 76; diarrhœa, p. 102.

6.

Sulphate of magnesia	ʒj to ʒij
Syrup of ginger	℥ss
Dill water to	℥iij

A drachm three times a day.

For constipation, p. 77.

7.

Manna	ʒij
Syrup	℥j
Caraway water to	℥ij

A drachm three times a day.

For constipation in infants, p. 77.

8.

Spirit of nitrous ether	ʒj
Sulphate of magnesia	ʒj
Syrup of tolu	ʒij
Solution of carbonate of magnesia	℥ij

A drachm twice or three times a day.

For constipation with flatulence, p. 78; catarrhal jaundice, p. 461.

9.

Bicarbonate of soda	ʒj
Tincture of nux vomica	♏iij
Compound tincture of cardamoms	ʒij
Syrup	ʒij
Chloroform water	℥ss
Water to	℥ij

A drachm every six hours (Eustace Smith).

In this prescription, the alkali should cause the separation of the strychnia from the tincture of nux vomica, but the amount of the alkaloid is so small that it is held in solution by the water.

For constipation with flatulence, p. 78; in urticaria, p. 765; in acute eczema, p. 766.

10.

Bicarbonate of soda	ʒj
Solution of bismuth	ʒij
Syrup of tolu	ʒij
Caraway water to	℥ij

A drachm four times a day.

For flatulence, p. 79; diarrhœa, pp. 93, 740.

11.

Bicarbonate of soda	ʒj
Carbonate of bismuth	ʒss
Compound powder of tragacanth	ʒss
Syrup of tolu	℥ss
Caraway water to	℥ij

A drachm three times a day.

For flatulence, 79; diarrhœa, pp. 93, 740; for vomiting.

12.

Bicarbonate of soda	ʒjss
Tincture of rhubarb	ʒij
Syrup of orange or ginger	℥j
Infusion of calumba or peppermint water to	℥iij

One or two drachms three times a day.

For constipation, p. 80; urticaria, p. 765; as aperient, p. 100; gastric catarrh, p. 135.

13.

Sulphate of magnesia	ʒij
Ipecacuanha wine	ʒj
Raspberry vinegar	℥jss
Water to	℥iij

Two drachms twice or three times a day.

For constipation, p. 80.

14.

Euonymin	gr.¼
White sugar	gr.v.

Once, twice, or three times a day.

For constipation, p. 81 ; in eczema, p. 766.

15.

Tincture of podophyllum (B.P.)

One or two drops on sugar once or twice a day.

For constipation, p. 81.

16.

Solution of arseniate of soda	ʒj
Glycerine	ʒij
Compound decoction of aloes	℥iij

One or two drachms three times a day for a child of six to ten.

Tonic and laxative, p. 81 ; for chronic arthritis, p. 684 ; rheumatism, p. 682.

17.

Ol. morrhuæ	
Syrup. calcis lactophosph.	aa.♏xviij
Liq. calcis	♏xviij
Sodii hypophosphitis	gr.j.
Mucilaginis	♏viij
Ol. cassiæ	♏$\frac{1}{9}$

One drachm three times a day (J. Thomson).

For rickets, p. 740 ; tuberculosis, p. 384 ; chronic arthritis, p. 684 ; anæmia, p. 452 ; chronic eczema, p. 768.

18.

Solution of strychnia	♏xx
Solution of pernitrate of iron	ʒj
Dilute nitric acid	ʒss
Glycerine	℥ss
Caraway water to	℥iij

Two drachms three times a day.

Tonic, p. 81 ; in stomatitis, p. 151.

19.

Green extract of belladonna	gr.j.
Glycerine	℥j
Iron wine to	℥iij

Two drachms three times a day.

Tonic and laxative, p. 81.

20.

Creosote	♏ij to iv
Syrup of tolu	℥j
Camphor water to	℥jss

A drachm when necessary.

For diarrhœa, p. 94 ; for whooping-cough, p. 286 ; for tuberculosis.

21.

Citrate of potash	ʒj
Solution of acetate of ammonia	ʒiij
Ipecacuanha wine	ʒj
Aromatic syrup	ʒj
Water to	℥ij

A drachm every four hours.

For pneumonia, p. 362 ; for bronchitis.

22.

Bicarbonate of potash	ʒj
Oil of sweet almonds	℥ss
Glycerine	ʒij
Compound powder of tragacanth	ʒss
Caraway water to	℥ij

A drachm every four hours.

For bronchitis, p. 336.

23.

Sulphate of magnesia	ʒj
Sulphate of iron	gr.viij
Dilute sulphuric acid	ʒij
Syrup of ginger	℥ss
Caraway water to	℥iv

Two drachms three times a day.

Tonic and laxative, p. 100 ; for anæmia, p. 452.

24.

Liquid extract of opium	♏xx
Sulphate of iron	gr.xvj
Solution of carbonate of magnesia . .	℥ij
Syrup of ginger	ʒj

Two drachms three times a day for children of five to ten years of age.

For lienteric diarrhœa, p. 101.

25.

Extract of logwood in powder . . .	gr.xx
Ipecacuanha wine	♏xx
Opium wine	♏x
Chalk mixture	℥ij

A drachm every four hours.

For chronic diarrhœa, p. 102 ; diarrhœa in typhoid, p. 301.

26.

Extract of logwood	ʒij
Tincture of catechu	ʒiij
Syrup	ʒij
Cinnamon water	℥iij

Dose for a child two years old, two drachms (Hillier).

For chronic diarrhœa, p. 102.

27.

Gallic acid	gr.x
Wine of opium	♏v
Rectified spirit	ʒjss
Chloroform water to	℥jss

A drachm three times a day.

For chronic diarrhœa, p. 103 ; chronic bronchitis, p. 339.

28.

Sulphate of copper	gr.j
Dilute sulphuric acid	ʒss
Spirit of chloroform	ʒss
Syrup	ʒij
Caraway water to	℥jss

A drachm three times a day.

For chronic diarrhœa, p. 103.

29.

Acetate of lead	gr.viij
Dilute acetic acid	♏xx
Opium wine	♏x
Syrup	ʒiij
Water to	℥jss

A drachm three times a day.

For chronic diarrhœa, p. 103.

30.

Chlorate of potash	ʒj
Tincture of cinchona	ʒj
Dilute hydrochloric acid	ʒj
Aromatic syrup	℥jss
Water to	℥vj

Half an ounce every four hours for children of eight or ten years.

For stomatitis, p. 151; thrush, p. 159; scarlet fever, p. 213.

31.

Compound tincture of camphor	ʒj
Solution of acetate of ammonia	ʒiij
Citrate of potash	ʒj
Syrup of tolu	℥ss
Water to	℥iij

One or two drachms every three hours.

As febrifuge, p. 135; in measles, p. 186.

32.

Bicarbonate of potash	ʒj
Tartrate of iron	℥j
Spirit of wine	ʒij
Syrup	℥ss
Water	℥iij

Two drachms three times a day.

For mucous disease, p. 112 ; anæmia, p. 452.

33.

Oil of turpentine	℥ii
Honey	℥jss
Compound powder of tragacanth	ʒj
Peppermint water to	℥vj

Two drachms three times a day.

For tapeworm, p. 120 ; smaller doses for abdominal distension in typhoid, p. 300.

34.

Dilute hydrocyanic acid	♏vj
Bicarbonate of soda	ʒj
Glycerine	℥ss
Caraway water to	℥iij

A drachm every three or four hours.

For vomiting of infants, p. 140

35.

Calomel	gr.j
Resin of jalap	gr.ij
Scammony powder	gr.v

Jalapine may also be conveniently administered by dissolving a gelatine lamel in warm milk.

Purgative, pp. 80, 119.

36.

Sulphate of iron	gr.xij
Liquid extract of liquorice	℥ss
Compound decoction of aloes to	℥iij

Two drachms to half an ounce three times a day

For threadworms, p. 119 ; for anæmia, p. 452

37.

Ipecacuanha wine	ʒij
Spirit of nitrous ether	ʒj
Syrup of tolu	℥j
Glycerine	℥ss
Water to	℥iij

A teaspoonful as often as may be necessary.

For bronchitis, p. 336; in typhoid, p. 301; in measles, p. 186.

38.

Alum	ʒij

Boil in a pint of milk and sweeten. A teaspoonful frequently.

For melæna neonatorum, p. 108; bronchitis, p. 339.

39.

Tincture of digitalis	ʒj
Solution of acetate of ammonia . . .	ʒjss
Spirit of nitrous ether	ʒij
Syrup of tolu	℥ss
Caraway water to	℥iij

A drachm every two or three hours.

For ascites, p. 447; nephritis, p. 483; heart disease, p. 695.

40.

Ointment of nitrate of mercury . . .	ʒj
Glycerine	℥j
Carbolic oil (1 x 40)	℥iij

Another good application for similar purposes is—

Sulphate of zinc	gr.iv
Glycerine of tannin	ʒj
Glycerine to	ʒij

For otorrhœa, p. 215.

41.

Glycerine of carbolic acid	♏ xv
Caraway water to	℥iv

One or two drachms every four hours.

For whooping-cough, p. 282.

42.

Iodoform	ʒss
Eucalyptus oil	℥ss to ℥j
Glycerine or vaseline to	℥ij or ℥iij

For sore nostrils in nasal catarrh, p. 310.

43.

Alum	ʒss
Ipecacuanha wine	ʒjss
Syrup of tolu	℥ss
Dill water to	℥iij

Two drachms every three or four hours.

For whooping-cough, p. 286; bronchitis, p. 339.

44.

Solution of arseniate of soda	ʒj
Benzoate of soda	ʒij
Syrup of tolu	℥j
Water to	℥iij

One or two drachms three times a day for a child of six to ten years.

For pulmonary tuberculosis, p. 384; anæmia, p. 452; chronic arthritis, p. 684; leucocythæmia, p. 456.

45.

Chloride of calcium	ʒj
Liquid extract of liquorice	ʒss
Glycerine	ʒij
Water to	℥iij

Two drachms three times a day.

For hæmophilia, p. 720.

46. SIMPLE ELIXIR.

An American vehicle for the administration of medicines.

Spirit of orange (oil 1, rect. spt. 9)	℥ss
Rectified spirit	℥ivss
Distilled cinnamon water	℥vj
Syrup	℥vj

Mix and filter. Twenty drops to be added to the ounce of any mixture. (Martindale and Westcott.)

For administering guarana (p. 629) or other drugs.

47.

Carbonate of ammonia	gr.xxiv
Bicarbonate of potash	ʒij
Liquid extract of liquorice	℥ss
Water to	℥iij

A drachm every three or four hours.

For bronchitis, pp. 336, 347, 725; broncho-pneumonia, p. 370.

48.

Bicarbonate of soda	gr.xxiv
Glycerine	ʒj
Elderflower water to	℥vj

For a lotion.

For lichen urticatus, p. 764; acute urticaria, p. 765.

49.

Perchloride of mercury	gr.iij
Chloroform	♏xx
Glycerine	ʒij
Rose water to	℥vj

For a lotion.

For lichen urticatus, p. 764.

50.

Carbolic acid (Calvert's No. 2).
Nitrate of mercury ointment.
Sulphur ointment.

The proportions will vary with the age of the child; equal parts will be borne by children over ten. For younger children, or for more extensive application to scattered patches, the carbolic and citrine ointments must be diluted with two, three, and four parts of sulphur ointment.

The pure crystallised carbolic acid must be used, or the ointment will change colour; and the citrine ointment must be quite free from any excess of nitric acid.

The carbolic acid is to be thoroughly mixed with the sulphur ointment first, and the citrine ointment rubbed in last—no heat is to be applied. The ointment should be freshly made every week or ten days. (Alder Smith.)

For ringworm, p. 782.

51. LASSAR'S PASTE.

Acid. salicylic.	gr.xv
Pulv. zinci oxidi	
Pulv. amyli	aa.℥ij
Lanolini	
Vaselini opt.	aa.gr.xv

For eczema, p. 767.

52.

Ammoniated mercury	gr.vj
Red oxide of mercury	gr.vj
Essential oil of almonds	♏ij
Benzoated lard	℥j

For ringworm, pp. 782, 785.

53.

Carbonate of ammonia	ʒss
Tincture of cantharides	℥jss
Spirit of rosemary	℥ss
Water to	℥vj

For alopecia areata, p. 785.

54.

Sulphur	ʒss
Ammoniated mercury	gr.iv
Creosote	♏iv
Oil of chamomile	♏x
Lard	℥j

For scabies, p. 787.

APPENDIX II.

RECIPES.

"*Directions for Making Artificial Human Milk,*" *from Playfair's* "*Science and Practice of Midwifery.*"

"TAKE half a pint of skimmed milk, heat it to about 96°, and put into the warmed milk a piece of rennet about an inch square. Set the milk to stand in a fender, or over a lamp, until it is quite warm. When it is set, remove the rennet, break up the curd quite small with a knife, and let it stand for ten or fifteen minutes, when the curd will sink. Then pour the whey into a saucepan, and let it boil quickly. Measure one-third of a pint of this whey, and dissolve in it, when hot, 110 grains of sugar of milk. When this third of a pint of whey is cold, add to it two-thirds of a pint of new milk and two teaspoonfuls of cream, and stir. The food should be made fresh every twelve hours, and warmed as required. The piece of rennet, when taken out, can be kept in an egg-cup, and used for ten days or a fortnight.

"N.B.—It is often advisable during the first month to use rather more than a third of a pint of whey, as the milk is apt to be rather too rich for a newly born child."

To this I would add that rennet is generally difficult to procure, and perfectly reliable preparations are now made, and will be found in Benger's curdling powders, or Benger's artificial rennet.

Directions for the Artificial Digestion of Milk.

(ROBERTS.)

A pint of milk, diluted with a quarter of a pint of water, is divided into equal parts—one part being heated to boiling and the other remaining cold, and the two mixed. In this way the required heat is procured—an essential point, for the ferment is destroyed by a temperature of over 140° F. The dilution prevents the curdling of the milk on the addition of the digestive fluid. Into the milk thus prepared are put two teaspoonfuls of Benger's or Savory and Moore's liquor pancreaticus and twenty grains of bicarbonate of soda, or one tube of Fairchild's zymine, and the milk is then placed under a cosy near the fire. It is to be tasted occasionally, and as soon as a bitter taste is perceptible—usually in a quarter of an hour to twenty minutes—the whole is boiled, to arrest any further action. It is then ready for use.

It may be made more palatable by using skimmed milk, and restoring the cream after the digestion has been accomplished and the process stopped by boiling.

If the digestion be allowed to proceed too far, the product is bitter and unpalatable.

The process is made even more simple by using the peptonising pellets prepared by Messrs. Savory and Moore. The milk being brought to the requisite heat as before, one pellet is added to the pint. A quarter of an hour is the average time for an adequate change to be accomplished.

Koumiss.

Mix together new milk forty ounces, water forty ounces, brewers' yeast one ounce, and loaf-sugar three ounces in an open jar; allow the mixture to stand at 30° C. for five or six hours. When bubbles of gas begin to rise in it, add milk forty ounces, water forty ounces, and milk-sugar 4½ ounces; then bottle, being careful to secure the corks with string or wire. Keep in a cool place for five days before using.* Tap with a champagne cannula, not by removing the cork. If used for the feeding of infants, the gas should be liberated from the koumiss by shaking it in an open glass before administration.

Directions for Making Beef- or other Meat-tea.

Take, for strong tea one pound, for weak tea half a pound, of lean beef or other meat, mince it finely, and put it into a preserve jar, and pour upon it a pint of cold water; stir, and allow the two to stand for about an hour. Next stand the jar in a saucepan of water, and place it on the fire or gas stove for an hour. Pour the contents on to a strainer. Make up to the pint.

It is a good plan, while the tea is making, to stew with it any green vegetable, cauliflower, or snips of carrot that may be at hand.

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* Art. Infant-feeding. "Encycloped. Medica."

To make Mutton Broth.

Cut one pound of lean mutton into small pieces, and place it in a saucepan with three pints of cold water; add a little salt, heat to boiling-point, and then allow it to simmer for three hours; strain, and when cold skim off the fat; serve warm.

To make Veal Broth.

Mince half to one pound of lean veal, pour upon it a pint of cold water; let it stand for three hours, then slowly heat to boiling-point; after boiling briskly for two minutes, strain through a fine sieve and season with salt. (Starr.)

To make Chicken Broth.

A small chicken, or half of a large fowl, thoroughly cleaned and with all the skin and fat removed, is to be chopped, bones and all, into small pieces; put them with a little salt into a saucepan and add a quart of boiling water; cover closely, and simmer over a slow fire for two hours; after removing, allow to stand, still covered, for an hour; then strain through a sieve. (Starr.)

To make Raw Meat Juice.

Raw meat juice is best made from rump steak. The meat is finely minced and then placed in a cup, and enough cold water added just to cover it. After standing for one hour, the meat is strained off through fine muslin, and everything possible forcibly expressed from the meat fibre into the liquor. The quantity of water may vary as the strength required. Dr. Cheadle directs that cold water should only be added in the proportion of one part to four parts of meat.

Cheadle's Mixture.

A thick slice of bread (4 oz.), and two or three days old, so as to be dry and sweet, and of seconds flour (since this is richer in proteid and phosphates than the finest white flour), is placed in a basin of cold water and soaked for six or eight hours. It is then taken out and all the water squeezed out of it to clear away the lactic acid formed in fermentation, and all other peccant matters.

The pulp is then placed in fresh water and gently boiled for an hour and a half, thoroughly to break up the starch corpuscles, and convert the starch into dextrine and grape sugar. The thick gruel thus made is strained, rubbed through a fine hair-sieve, and allowed to grow cold, when it forms a fine, smooth, jelly-like mass. This should be freshly prepared night and morning, for it will not keep long.

Enough of the jelly is then mixed with warm water, previously boiled, to make a food of the consistence of thin cream, about one full tablespoonful to eight ounces of water, so as to pass readily through the bottle ; a little white sugar may be added.

This is made a more complete food by adding boiled milk, or raw meat juice, or both.

The milk should be extremely small in quantity at first, especially if the child has already shown intolerance of cow's milk, two teaspoonfuls of boiled milk or even one only to the three ounces or half-bottle. The milk may be gradually increased every few days as the child is found able to digest it, the stools being carefully examined for signs of undigested curd. Thus the child may be gradually advanced to the requisite quantity of milk. Peptonised milk may be added at first in place of boiled milk, and the quantity increased more rapidly, and in cases where there is absolute intolerance of milk it may be replaced by raw meat juice and cream. Dr. Cheadle further adds, that this combination as a substitute for milk is of great value ; the bread jelly is extremely bland ; the raw meat albumen is most digestible as well as nutritious, and the cream supplies the necessary fat. This food in the following proportions: bread jelly solution 4½ parts (five tablespoonfuls) ; raw meat juice 1½ parts (six teaspoonfuls) ; cream ½ part (two teaspoonfuls), gives a slight deficiency of proteid and of carbohydrates, but an ample amount of fat.

When it is thought desirable to raise the strength to the full standard, the amount stands thus : four parts of bread jelly solution ; three parts of raw meat juice ; half a part of cream ; and a fifth part of sugar.

There is one source of danger, however, in using this food, viz., the liability of the raw meat juice to undergo decomposition. To be safe, it should be freshly prepared twice a day ; as also the bread jelly. The cream should be obtained fresh night and morning. Lastly, the meat juice must not be added to the food when hot, or the albumen is coagulated and its special digestibility thereby destroyed. (Cheadle, "Artificial Feeding and Food Disorders of Infants.")

Baked Flour.

Press tightly into a pudding-basin a quantity of flour, which is to be tied over tightly with a cloth. Put into a saucepan of boiling water and keep it boiling and well covered with water for eight hours. Then take it out of the saucepan. Take the ball of flour out of the basin and carefully remove all the outside crust. It is then to be cut up into very small pieces and placed out on a large dish, and the dish allowed to remain all night in an oven that has been well heated during the day, leaving the door open.

The following morning it is to be thoroughly pulverised with a rolling-pin; then put into a tin canister and kept covered down in a dry place.

To make the food: Take one heaped-up teaspoonful of the flour, mix thoroughly with a little drop of milk in a cup or small basin. Have ready some boiling water (one quarter of a pint), which add gently, keeping the flour well stirred. The whole is to be returned to the saucepan and allowed to boil gently for one minute.

It is then to be poured into a small vessel and a sufficient quantity of milk added to make it the proper warmth for an infant to suck from a bottle.

Albumen Water (White-of-egg Mixture).

The white of one raw egg, which must be perfectly fresh, is cut in several directions with a clean pair of scissors, and then mixed with half a pint of cold water. The mixing is best done by shaking them together in a closed bottle. A little cinnamon water or dill water may be used to flavour the mixture, to which also sugar may be added if thought desirable.

Whey.

To make whey, follow the directions given for making artificial human milk to end of seventh line, using Benger's artificial rennet.

White-wine Whey.

Heat half a pint of milk just to the boiling-point, and then add a good wineglassful of sherry (the curd separates more readily if one or two teaspoonfuls more of the sherry be added); then heat to boiling-point again, and, when the curd has settled, strain through muslin.

Junket.

Take a pint of new milk to which a teaspoonful of sugar has been added, and let it stand in a bowl near the fire or on a stove until it is warmed to blood-heat. Then add two teaspoonfuls of essence of rennet and stir gently for a few seconds. Allow to stand at a little distance from the fire until the curd is firmly set; then keep in a cool place until required. A little brandy can be added to the milk if desirable.

Barley Water.

Put two good teaspoonfuls of washed pearl barley into a saucepan with a pint of cold water, and boil slowly down to two-thirds of a pint, and strain. (Eustace Smith.)

A simpler method is to use Prepared Barley, a heaped teaspoonful of which is mixed with a little cold water to make a thin paste; boiling water is then added to make half a pint, and the whole poured into a saucepan and boiled for five minutes, with constant stirring.

Oatmeal Water.

Add from one to three tablespoonfuls of well-cooked oatmeal porridge to a pint of water; heat almost to boiling-point, with constant stirring, until a smooth mixture is obtained; strain.

Rice Water.

Wash well one ounce of Carolina rice with cold water. Then macerate for three hours in a quart of water kept at tepid heat, and afterwards boil slowly for one hour, and strain. (Pavy.)

Lime Water.

Take a piece of unslaked lime as large as a walnut, drop it into two quarts of pure filtered water contained in an earthen vessel, stir thoroughly, allow to settle, and use only from the top, replacing the water and stirring as consumed.

It is sometimes convenient to use a more concentrated form of lime water than the liquor calcis of the Pharmacopœia. It is useful to remember for this purpose that a teaspoonful of the liquor calcis saccharatus to four tablespoonfuls of water gives a solution of nearly the same strength.

An even simpler way is to add the saccharated lime solution direct to the food: for instance, to a feed of eight tablespoonfuls of milk or milk and water, fifteen or twenty drops of the liquor calcis saccharatus may be added.

Diet for Choreic Cases treated by Massage, &c.

At 5.30 A.M., half a pint of warm milk ; 7 A.M., half a pint of milk and three slices of bread and butter (each slice an ounce in weight) ; 9.45 A.M., half an ounce of Kepler's Malt Extract in lemonade ; 10 A.M., massage (fifteen minutes), followed by half a pint of warm milk ; 12.30 P.M., rice pudding, half a pint of milk, green food, and potatoes ; 4.15 P.M., half a pint of warm milk, three slices of bread and butter, and an egg lightly boiled ; 7 P.M., half an ounce of Kepler's Malt Extract in lemonade ; 7 or 8 P.M., massage, followed by half a pint of milk. At the end of ten days or a fortnight, the bread and butter is increased to four slices at 7 and 4.15 ; a lean chop is added to the mid-day meal, and an extra pint of milk is distributed over the twenty-four hours.

This diet was worked out by Dr. John Phillips, when resident at the Evelina Hospital, and I have found it very useful.*

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* See *Lancet*, 1882, vol. ii. p. 181.

APPENDIX III.

The following directions to mothers respecting the care of children with infantile paralysis are in use at the Hospital for Sick Children Great Ormond Street. They were drawn up at the suggestion of Sir Thomas Barlow.

LOWER LIMBS.

Clothing.

They must be kept warm day and night.

Knitted woollen stockings to come up above the knees.

If these do not keep the limbs warm, woollen overalls to be worn outside the stockings. The overalls to come up the thighs.

If these are not sufficient to keep the limbs warm, the overalls must be lined with cotton wadding, which is to be quilted so as to hold fast to the overalls.

For the night a flannel sack, made the shape of the leg and coming up to the top of the thigh, is the best. This sack should be lined with cotton wadding.

Rubbing.

For a quarter of an hour twice daily.

Set the child on a chair, or lay it on the bed, or let it sit on somebody's knee.

1. Rub the paralysed leg from the foot up to the top of the thigh. Rub upwards only. Put the broad part of your hand on the back of the child's leg. In rubbing the thigh, you may put your hand, first on the back of the child's thigh and afterwards on the front of its thigh. But always rub upwards, and be sure to go as high as the child's loins. Whilst rubbing with your right hand, hold the child's foot with your left. Use for rubbing any kind of oil.

2. Take hold of the child's leg with your two hands just above the ankle. Rub round the leg with your two hands in the opposite direction, as though you were wringing out sheets. Work up the

leg and thigh, from the foot up to the top of the thigh, in the manner described.

3. Take the child's calf with your two hands. Put your fingers to the back of the leg and your thumbs to the front. Squeeze the soft parts out between your fingers and thumbs, so as to flatten the leg out and make it as wide as possible. Work right up the leg and thigh in this manner.

4. Put your right hand over the front of the child's knee. Put your left hand against the child's foot. Push up the child's foot, and holding your right hand in front of the child's knee you will prevent yourself doing any harm. You want, if possible, by pushing the child's foot, to make the child push against your left hand with all its might. *This is the most important of all the exercises.*

5. Flip every part of the leg and thigh with your fingers, so as to make the whole of the limb quite red and warm.

6. Gently rub up and down all over. This will take the stinging away which was left by the last movement.

Baths.

Once a day let a large jugful of hot water, containing two handfuls of salt, be poured down the leg and thigh.

Then pour about half the quantity of cold water over the leg and thigh.

Then rub thoroughly dry with a towel, and continue to rub until the limb is perfectly warm.

Mutatis mutandis the directions apply equally, of course, to the upper limb when that is paralysed.

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